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CHAPTER 634

DECK COVERINGS

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NOTE

THIS CHAPTER HAS BEEN REFORMATTED FROM DOUBLE COLUMN TO SINGLE COLUMN TO SUPPORT THE NSTM DATABASE. THE CONTENT OF THIS CHAPTER HAS NOT BEEN CHANGED.

CHAPTER 634

DECK COVERINGS

SECTION 1.
GENERAL INFORMATION

634-1.1 INTRODUCTION

634-1.1.1 SCOPE. This chapter contains information on the installation and maintenance of deck coverings, gratings, and caulking compounds used for sealing deck seams.

634-1.1.2 REQUIREMENTS. Satisfactory deck coverings for naval ships are lightweight, wear and skid-resistant, nonflammable, and possess the ability to protect the deck from corrosion, present an attractive appearance, and are easily maintained. Simple installation and low cost are also important considerations. Since no single material is able to meet all these requirements, each material approved for use is the result of compromise.

634-1.1.2.1 Deck coverings are classified on the basis of use aboard ship. Where a material is restricted to a particular class of ships, this also is indicated. Information on other specialized deck coverings should be obtained from the Naval Sea Systems Command (NAVSEA). Spaces in which no deck covering is installed are to be painted in accordance with instructions in **NSTM Chapter 631, Volume 2, Preservation of Ships in Service - Surface Preparation and Painting** .

634-1.2 APPROVAL

634-1.2.1 New and experimental deck coverings will be approved for evaluation on an individual case basis. Authorization for the installation of experimental deck coverings must be obtained from NAVSEA. When approval is granted, full installation data, and later follow up reports, will be required.

634-1.2.2 Deck coverings listed herein are specified for ships in service. On ships in service where weight and moment compensation is required (except for slip-resistant materials), approval for initial installations only should be requested of NAVSEA via the Type Commanders. Approval for the initial installation on ships in service is issued only after proper weight and moment compensation is established in accordance with existing policies, procedures, and instructions.

634-1.3 INSTALLATION CRITERIA

634-1.3.1 If the existing deck covering is functional it should not be replaced even if it does not agree with the materials listed for the specific space. New deck coverings should be installed only where none are now present, or where existing authorized deck coverings are beyond economical repair. When repairs are required, local repairs should be made, if at all possible, rather than complete removal and reinstallation of a new deck covering. Where replacement is made the deck covering specified herein should be installed. If a new deck covering is being installed, it shall not be installed over an existing deck covering other than primer or underlayment, except as noted herein.

634-1.4 GENERAL SAFETY PRECAUTIONS

634-1.4.1 Potential hazards are encountered in most deck covering applications. Therefore, a continuing safety program during installation is mandatory. Adherence to prescribed safety procedures will provide protection against major hazards such as fire, explosion, hazardous dust such as asbestos and crystalline silica, and toxicity.

1. Liquids, adhesives, and deck covering compounds containing volatile flammable solvents evaporate to form vapors which, if not removed or reduced in concentration by adequate ventilation, may form explosive or flammable mixtures. Every precaution shall be taken to ensure the elimination of ignition sources such as open flames from smoking, lighters, welding, and other operations involving sparks that can be generated from electrical equipment. A continuous fire watch shall be maintained during application of these materials to ensure that all safety precautions are observed.
2. Vapors from some of the solvents used may have a harmful or irritating effect on the human system, particularly in confined spaces. Air respirators and eye protectors shall be worn, depending on the application. Container labels shall be read and followed for specific safety instructions concerning flammability and toxicity.
3. Dust created during ripout of existing deck covering materials may present a possible risk of carcinogenicity. Asbestos, although no longer present in deck covering materials, may exist from installations accomplished prior to 1980. Asbestos is a known carcinogen. Additionally, many deck covering underlay materials, and latex concrete, mastic, terrazzo, and cosmetic polymeric deck coverings contain crystalline silica from the sand or quartz components contained therein. During the removal of deck covering materials it is imperative that dust control measures be implemented. The use of personnel protective equipment, including respiratory protection is required.

634-1.4.2 The following safety precautions are applicable when working with certain materials under the conditions specified.

a. **Polyester** . When using resins, accelerators, catalysts, and flammable solvents for cleaning, all precautions and safety measures pertaining to flammable materials, such as no smoking, welding, or burning in the immediate areas, shall be enforced. The use of rubber gloves during the application of resin and glass cloth is recommended.

b. **Electric shock prevention** . An insulating deck covering is necessary to prevent electric shock to persons who may touch bare energized and ungrounded circuits while standing on bare decks. Although dry wood decks are not conductive, they constitute an electric hazard when wet, and both metal (steel and aluminum) and wood decks require an insulating deck covering. After installation, the decking should be checked at least once annually to ensure that the surface is not cracked, punctured, or perforated, and that no metal or conductive particles have been imbedded. If the decking is not cemented, check several areas with a caliper. Discard and replace if any thickness is less than 1/32 (0.03) inch. With a cemented deck, the thickness should be determined at least annually using a suitable thickness gauge such as one of the magnetic types cited in **NSTM Chapter 631** ; or a pin or needle may be inserted at a seam location (where 2 widths abut) and one depth measured. After test, fill seam with a rubber adhesive. Refer to paragraph 634-3.12 for more detailed information on prevention of electrical shock.

c. **Rubber sheeting** . When lining battery compartments with acid-resistant sheeting, observe the following precautions.

   1. The battery compartment and the platform above it shall be closed off to all trades except rubber shop workmen.

2. Both bulkhead doors shall be closed, and a fire watch shall be established and maintained during the lining operation.
3. Fire extinguishers (class B) shall be placed near the workmen having the rubber.
4. No smoking shall be permitted in the battery compartment or in the areas near it.
5. No welding nor smoking shall be permitted within a radius of 25 feet around the hatch leading to the battery compartment.
6. No welding shall be performed on either battery-space bulkhead.
7. These precautions shall be emphasized by appropriate signs and enforced by the fire watch.
8. Adequate forced-draft ventilation, preferably suction, shall be provided (minimum one air change per minute).

d. **Slip resistant coverings** . Since all compounds used for installation of skid-resistant deck covering contain volatile solvents which may be flammable, adequate safety measures must be taken during application.
   1. Certain sensitive individuals handling the materials may develop a skin rash; therefore, gloves should be worn. Any materials spilled on the body should be wiped off and the skin washed with soap and water. In case of contact with the eyes, flush the eyes immediately with clear water and contact a physician. Clothing and gloves contaminated with the uncured resins should not be worn again until they have been thoroughly cleaned. Because some formulations may use materials that fume when in contact with air, adequate exhaust ventilation is necessary in closed spaces. If the proper precautions are taken to ensure cleanliness, ventilation, and protective clothing, no difficulty should be encountered in using or handling epoxy resins, hardeners, or solvents.
   2. For interior areas where nonskid materials are rolled, troweled, or sprayed, and for a minimum of 1 hour after the non-skid has cured, the following safety precautions shall be observed:
      (a) Ensure absence of ignition source; all welding, smoking, hot work, open flames, energizing and deenergizing of electrical circuits in the compartment and adjacent areas shall be prohibited. Only explosion-proof lights shall be used and all portable electrical wiring shall be inspected for cracks and wear prior to use.
      (b) Use exhaust ventilation, preferably air-driven to open air, to reduce the solvent vapor concentration below the lower explosive limit. All exhaust ventilation in the area shall be secured and masked; the ventilation supply shall be left open. If it is necessary to use electrical motor-driven exhaust fans, only explosion-proof equipment shall be used. Ground all exhaust ventilation for electrostatic discharge, using approximately AWG20 cable with metal clips for attaching equipment to ground.
      (c) Portable dry chemical fire extinguishers shall be readily available.
   3. For more detailed information concerning safety of various non-skid materials in use, refer to paragraph 634-3.25 for specific safety measures that must be observed.

e. **Polyurethanes** . Polyurethane deck-covering compounds including MIL-D-24613 Type II (polyurethane) materials, PR-1539, PRC Primer #4 (for wood) and PRC Primer #420 (for metal), Nonskid PR-1139, and polyurethane caulking compounds can constitute fire and/or health hazards if improperly handled during application.

WARNING

PRC Primer #4 Marine and PRC Primer #420 Marine contain flammable and volatile solvents. Keep these materials away from heat, sparks, and open flames.

634-1.4.3 Health precautions applicable to the aforementioned materials are given as follows:

a. **Deck Covering Materials, Interior, Cosmetic Polymeric (MIL-D-24613)** . Since many of these products and systems use volatile solvents that may be flammable or injurious to health, safety measures must be implemented during and after application. During the application and for a time thereafter, until the material has cured and all vapors have dissipated, the following safety precautions shall be taken:

1. At-sea application of MIL-D-24613 Type II polyurethane deck coatings, except seal coats, in interior spaces shall be limited to repair and touch-up of small areas. Small areas are defined as 1 square yard or less. If there is more than one damaged area per compartment then the total area that can be repaired shall not exceed 2 percent of the total deck area of the space. The 1 square yard per patch per day limit is still in effect. Resealing of the entire compartment deck area is permitted. Epoxy deck coverings in accordance with MIL-D-24613 Type I or Type II may be installed, repaired, or resealed if the safety precautions in the following paragraphs are followed.
2. Traffic in the vicinity of the work area shall be restricted to allow only necessary personnel.
3. Maintain general mechanical ventilation in continuous operation during the application of the product. A minimum of ten air changes per hour is required. If unable to operate the ventilation or if the existing ventilation does not provide ten air changes per hour, then supplementary ventilation is recommended. If unable to provide necessary ventilation, all workers are required to wear full face organic vapor cartridge respirators. Personnel assigned to wear respirators shall be trained and medically screened to determine their fitness for wearing a respirator as directed by OPNAVINST 5100.19B, **Navy Occupational Safety and Health (NAVOSH) Program Afloat** .
4. All mixing shall be done at the work site. Application shall be by trowel, roller, or brush.
5. The uncured resin and components are flammable and shall be used and stored accordingly.
6. Quantities of uncured components allowed to be carried onboard shall not exceed that amount normally expected to be needed during the at-sea period, and shall be restricted to quart size unbreakable containers.
7. Installation and large scale repair or resurfacing of polyurethane materials, other than reglazing, shall only be accomplished at pier side, or in a shipyard by properly trained and protected personnel at the IMA level or higher, under the direct guidance of the Regional Industrial Hygienist, and observing the safety precautions of **NSTM Chapter 631, Volume 2, Preservation of Ships In Service - Surface Preparation and Painting** . Epoxy materials may be installed, repaired, and resealed with no limit as long as ventilation and personnel protection requirements are met.
8. Skin protection for the hands shall be provided by solvent resistant gloves. For epoxy systems butyl rubber gloves are recommended. For polyurethane systems polyvinyl alcohol (PVA) composition gloves are recommended, with alternate materials of either nitrile or chlorinated polyethylene (CPE) being acceptable. Cotton or disposable coveralls shall be worn to prevent contamination of clothing. Promptly remove and launder or dispose of contaminated non-impervious clothing before reuse. In the event of accidental skin contact, wash immediately with soap and water.
9. When a full face respirator is not worn, eye and face protection shall be provided. Splash-proof chemical goggles shall be worn by all personnel handling the materials who are not wearing full face respirators. Because of the increased potential for a splash to occur during mixing, it is required that the person doing the mixing wear a face shield in addition to the goggles. In the event of eye contact with the material, flush the eyes with clean water for fifteen minutes and seek prompt medical attention.
10. Personnel working with these products shall not eat, drink or smoke while handling the product. They shall wash their hands and face thoroughly with soap and water after work is complete and prior to eating, drinking or smoking.

11. The ship's medical department shall screen personnel for pre-existing rashes, eczema, or other skin diseases. Personnel with skin disease shall not be assigned to handle these materials.
12. All personnel who will be working with the polyurethane (Type II) materials shall be required to complete a medical and work history questionnaire for review by the ship's medical department representative. Personnel with a prior history of sensitization to isocyanates shall not be assigned to handle this product.

b. **PR-1539 Gray, PR-1139, PRC Primers #4 Marine, and #420 Marine (metal primer for caulking compound PR-3095)** . The uncured components of these priming materials will produce irritation following contact with the skin, eyes, or clothing. Avoid breathing vapors. When handling PR-1139, PRC Primers #4 Marine, and #420 Marine, avoid all contact with the body, especially contact with open breaks in the skin, and ingestion. Always wash hands before eating or smoking. PR-1139, PRC Primers #4 Marine, and #420 Marine contain mixed solvents. Additional cautions of paragraph (a) above shall apply.

c. **Rubber Caulk 3095 Sealant** . This rubber caulk sealant can be a safe material to handle when reasonable care is observed. Ordinary hygienic principles, such as washing the compound from the hands before eating or smoking, should be observed. Avoid breathing of vapors, contact with the skin, and ingestion.

d. **1.1.1 Trichloroethane** . Keep this cleaning solvent away from open flame. It decomposes into a harmful gas when exposed to open flame.

e. **Polysulfide Caulking Compounds, Lead Peroxide, and Solvents** . Adequate fire and safety precautions must be taken with solvents and primers because they are flammable and hazardous to health if used in confined spaces without adequate ventilation. Hygienic precautions specified for handling lead peroxide apply also for handling the accelerator and the mixed compound, in order to prevent skin and mouth contact. Water-soluble hand cream shall be applied before handling.

f. **Flight Deck Cleaning** . Fire and health precautions are as follows:

1. **Fire Prevention** . Jet fuel, grade JP-5 is no longer approved for deck cleaning due to safety hazards.
2. **Health Protection** . Use eye shields to protect the eyes from cleaning solutions and sodium metasilicate dust. If contact occurs, wash eyes with large amounts of freshwater for a few minutes. Report to physician immediately for further treatment. If practical, stand upwind whenever handling mixing, or applying dry chemicals or solutions.

g. **Chemical Removal of Nonskid from Decking** . Methylene chloride, the principal solvent in paint remover, is dangerous to the eyes but otherwise is only moderately toxic. It is not a fire or explosion hazard under normal conditions of use, but it is dangerous when heated to decomposition because it emits highly toxic phosgene fumes. Methylene chloride vapors, being almost three times as heavy as air, tend to collect in low, unventilated spaces. If permitted to accumulate, they can reach dangerously toxic concentrations. The following safety precautions must be observed:

1. Exposed personnel shall be thoroughly instructed regarding hazards of the chemical removal process.
2. Persons working with the paint remover shall wear tight-fitting, rubber-framed, chemical-type goggles; rubber (neoprene) boots; rubber (neoprene) gloves; and coveralls.
3. Hatches and vents leading to lower spaces shall be secured to prevent entry of methylene chloride vapors into these areas.
4. The area to be treated shall be roped off and signs reading **NO SMOKING, NO BURNING WITHIN 50 FEET OF THIS SIGN** shall be conspicuously posted at the perimeter of the area.

634-1.5 SURFACE PREPARATION

634-1.5.1 GENERAL. Before any deck covering is applied, the deck should be cleaned free of rust, loose scale, and dirt. Grease and oil should be removed with approved solvents and clean rags. Paint and primers well adhered to the deck may remain intact unless otherwise specified herein. All attachments to the penetrations to the structure to be covered should be completed. When resilient deck coverings are installed, it is important that the surface to be covered be level and as smooth as possible. Unless properly faired, welds and high spots will show through resilient deck covering such as deck tiles or resilient sheet and will cause excessive wear in these areas. In such cases, if practicable, weld seams and high spots (those in excess of 1/16 inch) should be ground down to 1/16 inch and faired with underlay (see paragraph 634-3.7). Dished (concave) areas in deck plate should be filled with underlay.

634-1.5.2 EXTENT OF COVERAGE. The deck covering should normally cover the entire deck area of the compartment, except that it should not be installed under enclosed built-in furniture nor under equipment with enclosed foundations unless otherwise specified. If desired, resilient tile may be squared off at stiffeners (except at doors), and bare steel deck sections may be painted a harmonious color.

634-1.5.3 DECK PAINT. Decks should be cleaned, prepared, and primed as specified herein before installation of deck covering. Areas for which no deck covering is specified should be painted as required by **NSTM Chapter 631, Volume 2, Preservation of Ships in Service - Surface Preparation and Painting** . Both paint and floor wax destroy the nonskid properties of slip-resistant materials. The application of paint, thinned or unthinned, over slip-resistant deck coverings is strictly prohibited due to safety considerations.

SECTION 2.

APPROVED DECK COVERING MATERIALS BY AREA

634-2.1 MATERIALS APPROVED FOR SHIPBOARD SPACES

634-2.1.1 A comprehensive list of diverse shipboard locations, together with deck-covering materials that are approved for use in each specific area, is provided in Table 634-2-1.

Table 634-2-1. APPROVED DECK COVERING MATERIALS

SPACE	MATERIAL
EXTERIOR (SURFACE SHIPS - STEEL)	
Flight deck (in the vicinity of metal deck and arresting wire terminal fitting)	Impact pads (polyurethane)
Flight deck (in the vicinity of wood deck and arresting wire terminal fitting)	Impact pads (butyl rubber or polyurethane)
Flight deck (metal and wood)	Slip-resistant covering
Helicopter landing deck (metal and wood)	Slip-resistant covering
Missile launcher area	Slip-resistant covering
Missile house top; sloping and flat surfaces	Slip-resistant covering
Traffic areas[1]	Slip-resistant covering
Wood surfaced areas	Wood decking and polyurethane overlay

Table 634-2-1. APPROVED DECK COVERING MATERIALS - Continued

SPACE	MATERIAL
Working areas (areas outside or direct traffic routes surrounding topside equipment such as fire control stations, gun circles, lookout stations, director platforms, areas around deck machinery, boats, and replenishment-at-sea stations). Hazardous areas on mainmast, yardarms, antenna platforms, and other areas considered hazardous under wet conditions.	Slip-resistant covering
INTERIOR (SURFACE SHIPS - STEEL)	
ADP key punch room	Deck tile
ADP room	Deck tile
AFFF station (within coaming)	Epoxy paint [4]
Airborne system support center (all areas)	Vinyl or electrical grade sheet
Air locks, type I	Slip-resistant covering
Air locks, type II and III	Deck tile
Ammunition space (dunnage system fill)	Latex concrete
Ammunition stowage, handling room, ready service room (in traffic and working areas only except on carriers)	Slip-resistant covering[2]
Auxiliary machinery spaces (in areas of possible lubricant or hydraulic fluid spills or leakage, except where nonslip plates or gratings are installed).	Slip-resistant covering[6]
Aviation survival equipment room	Deck tile
Avionics shop	Deck tile and electrical grade mat; or electrical grade sheet[3]
INTERIOR (SURFACE SHIPS - STEEL)	
Bacteriological laboratory	Deck tile or vinyl sheet
Bakery (outside of coaming)	Cosmetic polymeric, porcelain tile, quarry tile, or ceramic tile
Bakery (within coaming under steam kettle)	CRES pan
Barber shop	Deck tile with standing mat around each barber chair
Bath	Deck tile
Battery shop	Polyurethane deck covering system or rubber sheet
Battle dressing station	Deck tile
Battle dressing station (auxiliary)	Deck tile
Bread room	Deck tile
Brig	Deck tile
Cell lobby	Cosmetic polymeric
Sentry vestibule	Cosmetic polymeric
Business machine shop	Deck tile
Bio-medical repair workshops	Electrical grade sheet; or deck tile and electrical grade mat
Butcher shop	Cosmetic polymeric, porcelain tile, quarry tile
Carpenter shop	Slip-resistant covering
CC TV and entertainment room	Deck tile and electrical grade mat; or electrical grade sheet
Central control station	Deck tile
Chief of Staff cabin, stateroom, and cabin, and sea cabin	Carpet
Commanding Officer's office	Deck tile
Commanding Officer's stateroom, cabin, and sea cabin	Carpet
Commanding Officer's tactical plot[3]	Deck tile
Conference rooms	Deck tile

Table 634-2-1. APPROVED DECK COVERING MATERIALS - Continued

SPACE	MATERIAL
Conference and briefing room	Deck tile
Contaminated laundry (clean side)	Vinyl or electrical grade sheet
CPO living space	Deck tile or vinyl sheet
CPO lounge	Deck tile, carpet, or vinyl sheet
CPO mess room	Deck tile
CPO washroom, water closet, and shower space	Cosmetic polymeric, porcelain tile, or ceramic tile
Crew library	Carpet
Crew or crew and troop living space	Deck tile
Crew mess room	Deck tile
Crew recreation room (not part of a living space)	Deck tile
Crew shelter	Deck tile
Crew washroom, water closet, and shower space	Cosmetic polymeric, porcelain tile, or ceramic tile
Crypto room	Deck tile and electrical grade mat, or electrical grade sheet
CV Intelligence Center	Electrical Grade sheet
Dental operating room	Deck tile
Dental prosthetic laboratory	Deck tile
Dental spaces (not otherwise covered)	Deck tile
Diet pantry	Deck tile
Division Commander cabin and stateroom	Carpet
Dry-cleaning shop	Deck tile
Electrical/electronics spaces manned including, but not limited to, main comm., coding room, and CIC	Electrical grade sheet or deck tile with electrical grade mat
Executive Officer cabin and stateroom	Deck tile
Eye, ear, nose, and throat treatment and aviation examining room	Deck tile
Flag cabin, stateroom, and sea cabin	Carpet
Flag office	Deck tile
Flag planning center	Deck tile
Flag plot [3]	Deck tile
Flag radio center	Electrical grade sheet or deck tile with electrical grade mat
Fleet Commander and Commanding Officer	Ceramic tile
Flotilla Commander and Commanding Officer galley	Ceramic tile
Foundry (in front of furnace and pouring area)	Silica brick, silica sand, and steel grate
Fuel, oil, and water laboratory	Cosmetic polymeric
Galley	Cosmetic polymeric, porcelain tile, quarry tile or ceramic tile
Galley (within coaming under steam kettles)	CRES pan
Garbage disposal room	Magnesite or mastic
Hangar bays	Slip-resistant covering
Health physics room	Deck tile
HELO control station	Slip-resistant covering
Hobby shop	Deck tile
IC & gyro room	Electrical grade sheet or deck tile with electrical grade mat
Ice cream bar	Deck tile
Ice cream making room	Cosmetic polymeric, porcelain tile, quarry tile or ceramic tile
Isolation ward	Deck tile

Table 634-2-1. APPROVED DECK COVERING MATERIALS - Continued

SPACE	MATERIAL
INTERIOR (SURFACE SHIPS - STEEL)	
Isolation ward bath	Deck tile
Ladies room	Deck tile
Laundry (within coaming)	Cosmetic polymeric or epoxy paint
Laundry issuing and receiving room	Deck tile
Library	Carpet
Light traps	Slip-resistant covering
Living spaces (over tank tops)	Deck tile over on-deck insulation
Living spaces (not otherwise covered)	Deck tile
Lounges	Deck tile
Machinery space (within enclosed operating station)	Deck tile
Marine living space	Deck tile
Marine pressing shop	Deck tile
Marine pressing shop	Deck tile
Meat preparation room (except meat thawing area)	Cosmetic polymeric, porcelain tile, quarry tile, or ceramic tile
Meat preparation room (meat thawing area)	CRES pan
Medical operating room	Vinyl sheet [7]
Medical space (not otherwise covered)	Deck tile
Medical storeroom	Deck tile
Medical library	Deck tile
Medical X-ray exposure room	Deck tile
Mess Management specialist room	Deck tile
Mess rooms	Deck tile
Microfilm processing room	Deck tile
Mechanical instrument repair and calibration shop (MIRCS)	Vinyl sheet [7]
Missile handling, checkout magazine, ready service, and assembly rooms in traffic and working areas only; (except aluminum decks of liquid propellant motor magazines and on carriers)	Slip-resistant treads or covering
Motion picture projection room	Deck tile
Navigator sea cabin	Deck tile
Navigator stateroom	Deck tile
Noise and vibration analysis room	Deck tile
Noise and vibration test room	Deck tile
Nondestructive testing (NDT) laboratory	Deck tile
Offices	Deck tile
Officer washroom, water closet, and shower space	Mastic, cosmetic polymeric, porcelain tile, or ceramic tile
INTERIOR (SURFACE SHIPS - STEEL)	
Operating room, medical and adjacent scrub room, surgical dressing room, and sterilizing room	Vinyl sheet[7]
Optical shop	Deck tile
O_2 N_2 producer room, liquid storage room, liquid fill room	2-inch thick lightweight concrete surface with 3/16-inch thick aluminum diamond plate
Pantries (without dishwashing machine)	Deck tile
Pantries (with dishwashing machine)	Cosmetic polymeric

Table 634-2-1. APPROVED DECK COVERING MATERIALS - Continued

SPACE	MATERIAL
Passages (serving living, messing food) service, medical, dental, and office spaces)	Deck tile
Passages (adjacent to refrigerated spaces)	Cosmetic polymeric
Pharmacy	Deck tile
Photographic laboratory	Deck tile
Photographic laboratory-machine film processing room	Cosmetic polymeric
Physical fitness room	Deck tile
Physiotherapy space (wet)	Cosmetic polymeric, porcelain tile, or ceramic tile
Post office	Deck tile
Provision issue room (outside grating area)	Deck tile
Quiet room	Deck tile
Quiet room bath	Cosmetic polymeric, porcelain tile, or ceramic tile
Recreation room	Deck tile
Refrigerated cargo spaces	Porcelain tile or quarry tile
Scrub room	Cosmetic polymeric, porcelain tile, or ceramic tile
Scullery	Cosmetic polymeric, porcelain tile, ceramic tile, or quarry tile
Scullery passage	Cosmetic polymeric, porcelain tile, ceramic tile, or quarry tile
Senior Staff Officer cabin and stateroom	Carpet
Senior Staff Officer messroom	Deck tile
Ship control spaces (pilothouse, chartroom, communication spaces, and conning towers)	Deck tile and fiber mat at weather door
Ship Store	Deck tile
Ship Store (behind soda fountain)	Cosmetic polymeric
Shops (walking areas around power tools)	Slip-resistant treads
Shore steam locker	Cosmetic polymeric
Squadron Commander cabin and stateroom (not aviation)	Carpet
Squadron ready room	Deck tile
State room	Deck tile
Steering gear room	Deck tile
Sterilizer rooms (medical & dental)	Cosmetic polymeric, porcelain tile, or ceramic tile
Supply department office (aviation technical library)	Deck tile
INTERIOR (SURFACE SHIPS - STEEL)	
Supply department office (technical library)	Deck tile
Supply department office (supply response section consolidated)	Deck tile
Supply department storeroom (acid)	Rubber sheet or polyurethane deck system and wood gratings
Switchboard room, electrical	Electrical grade sheet or deck tile with electrical grade mat
Tactical command cabin and stateroom	Carpet
Teletypewriter shop	Deck tile
Trash compactor room	Porcelain tile or quarry tile
Troop Commanding Officer cabin and stateroom	Deck tile
Troop living space	Deck tile

Table 634-2-1. APPROVED DECK COVERING MATERIALS - Continued

SPACE	MATERIAL
Vegetable preparation room	Cosmetic polymeric, porcelain tile, ceramic tile, or quarry tile
Ward (medical)	Deck tile
Wardroom bath	Cosmetic polymeric, or ceramic tile
Wardroom bunkroom	Deck tile
Wardroom lounge	Carpet
Wardroom messroom	Deck tile or vinyl sheet
Wardroom pantry	Cosmetic polymeric, ceramic tile, or quarry tile
Watch stations	Standing mat
EXTERIOR/INTERIOR (WOOD SHIPS)	
Main deck (exterior)	Polyester glass, polyurethane deck system or other NAVSEA-approved material coated with slip-resistant covering
Repair of leaky exterior decks	Polyurethane overlay
Upper exterior levels	Slip-resistant covering
Commanding Officer's stateroom and cabin	Deck tile or carpet
Chill, freeze, and dry provisions storerooms (passage only, providing access to)	Polyester glass
Commissary spaces	Quarry tile or cosmetic polymeric
Crew living space	Deck tile or vinyl sheet
Crew messroom	Deck tile or vinyl sheet
Crew washroom and water closets	Mastic, ceramic tile, porcelain tile, or cosmetic polymeric
Engine room (over floor plates)	Deck treads
Executive Officer's stateroom and cabin	Deck tile
Foam proportioners (stationery) (within coaming)	Polyester glass
Galley	Porcelain tile, quarry tile, or cosmetic polymeric
Laundry	Polyester glass
Living spaces	Deck tile
Messrooms	Deck tile
Offices	Deck tile
Pharmacy	Deck tile
Sanitary spaces	Polyester glass
EXTERIOR/INTERIOR (WOOD SHIPS)	
Scullery	Polyester glass
Ship control spaces (electrical/electronics area)	Electrical grade sheet
Shops (walking areas around power tools)	Slip-resistant covering
Shower stall deck and bulkheads	Polyester glass
Steam kettles (within coaming)	CRES pan
Steering gear room	Slip-resistant covering
Steering stations	Standing mat
Wardroom living space	Deck tile or carpet
Wardroom messroom	Deck tile
Washroom and water closets (Officers)	Ceramic tile, porcelain tile, mastic, or cosmetic polymeric
Watch stations	Standing mats
MISCELLANEOUS (STEEL AND WOOD SURFACE SHIPS)	
Dry side of doors to weather decks	Door mats, portable

Table 634-2-1. APPROVED DECK COVERING MATERIALS - Continued

SPACE	MATERIAL
Operating and servicing areas in way of electric and electronic equipment (for prevention of electronic shock)	Electrical grade mat or sheet
At each side of door with high coaming normally used for continuous traffic, and at the head and foot of ladders	Slip-resistant treads (3-treads)
Working areas around steering gear, electrical machinery (except where rubber matting is installed), and as necessary to ensure safe footing around power tools	Slip-resistant covering (haze gray)
EXTERIOR/INTERIOR (SUBMARINES)	
Attack center	Electrical grade sheet (Type I)
Auxiliary machinery room 1 (upper level)	Electrical grade sheet (Type I)
Auxiliary machinery room 1 (middle level - excluding TRIDENT)	Electrical grade sheet (Type I)
Auxiliary machinery room 2 (upper level)	Electrical grade sheet (Type I)
Ballistic Missile Control Center (SSBN only)	Carpet (for noise control)
Battery compartment	Rubber sheet
Berthing spaces	Deck tile or vinyl sheet
CO^2 scrubber room	Electrical grade sheet (Type I)
Commanding Officer's stateroom	Carpet, deck tile, or electrical grade sheet
Conning tower	Deck tile or vinyl sheet
Control room	Electrical grade sheet (Type I)
Diving plane station (SS only)	Standing mat
Electronic equipment space	Electrical grade sheet (Type I)
Electronics surveillance measures space	Electrical grade sheet (Type I)
Engine room (upper level)	Electrical grade sheet (Type I)
EXTERIOR/INTERIOR (SUBMARINES)	
Engine room (lower level)	Rubber vinyl mat (uncemented)
Executive Officer's stateroom	Carpet, deck tile, or electrical grade sheet
Galley, scullery, and pantry	Ceramic tile, porcelain tile, quarry tile, or cosmetic polymeric[7]
Head and foot of ladders, at each side of doors with high coamings used for continuous traffic; elsewhere when required for safe footing.	Aluminum safety slip-resistant treads
Laundry	Ceramic tile, porcelain tile, quarry tile, or cosmetic polymeric
Machinery spaces (auxiliary)	Rubber mats (uncemented)
Maneuvering room	Electrical grade sheet (Type I)
Messing spaces	Deck tile or vinyl sheet
Missile compartment (upper level)	Electrical grade sheet (Type I)
Missile compartment (middle level)	Electrical grade sheet (Type I)
Missile control center	Electrical grade sheet (Type I) (rubber mat Type III) laid on top for noise control)
Navigation center	Electrical grade sheet (Type I)
Offices	Deck tile, vinyl sheet, or electrical grade sheet (Type I)
Passages serving messing, berthing, and office spaces	Deck tile, vinyl sheet, or electrical grade sheet (Type I)
Radar room	Electrical grade sheet (Type I)
Radio room	Electrical grade sheet (Type I)

Table 634-2-1. APPROVED DECK COVERING MATERIALS - Continued

SPACE	MATERIAL
Reactor tunnel	Electrical grade sheet (double seamed for spill control)
Shower stall	Ceramic tile, porcelain tile, mastic, or cosmetic polymeric[7]
Sonar room	Electrical grade sheet (Type I)
Steering station (SS only)	Watch station mat
Tank tops (forming part of a deck in air-conditioned spaces) in walled-in areas	Deck tile or vinyl sheet over Fiberglass or steel canning plate
Torpedo room (area around launch control console) (SSN-594, -637, and -688 classes)	Electrical grade sheet (Type I)
Wardroom	Carpet, deck tile, or electrical grade sheet
Washroom and water closet	Ceramic tile, porcelain tile, mastic, or cosmetic polymeric
Miscellaneous critical control areas to increase traction over vinyl area	Slip-resistant treads

[1]Traffic areas such as routes used for topside passage from and between doors, ladders, and important topside equipment, and to areas of other slip-resistant deck covering. In general, at least one complete circle of each deckhouse shall be covered. The topside passage shall be defined by a path approximately 36-inches wide.

[4]Deck within the coaming around AFFF stations (or laundry) shall be coated with three coats of epoxy paint, MIL-P-24441. Deck drains within coamings in AFFF stations shall be installed flush with the deck.

[2]In ammunition and missile stowage spaces where forklift trucks are used (but not where hyperbolic liquids are stowed) or where decks are raised by dunnage tracks in ammunition and on carriers, slip-resistant treads conforming to MIL-D-17951 shall be installed. Install treads approximately 3 inches apart and apply two thin coats of aluminum paint, FED SPEC TT-P-28, 1 mil dry-film thickness (minimum), between the treads to permit the dissipation of any static electricity generated by forklift trucks. A slip-resistant deck covering conforming to MIL-D-24883, MIL-D-23003, or DOD-C-24667 may be used in interior deck space in place of deck treads if the safety requirements outlined in paragraph 634-3.25 are followed. The non-skid material shall be installed over clean, bare steel in strips approximately 6 inches wide with uncoated bare spaces left between the strips of approximately 3 inches. The exposed metal shall than be coated with 2 thin coats of the aluminum paint.

[6]Heat weld or chemically seal the seams to form a seamless installation free of cracks and fissures. If MIRCS spaces are used for electrical or electronic calibration or repair, electrical grade vinyl sheet conforming to MIL-M-15562, type I shall be used.

[3]If electrical equipment is installed in this space, treat as an electronic space.

[7]When cosmetic polymeric (MIL-D-24613) is specified for submarines, type I or type III is authorized for use. Submarines shall not use type II.

SECTION 3.

MATERIALS, INSTALLATION, AND REPAIR

634-3.1 CERAMIC TILE

634-3.1.1 GENERAL. Ceramic tile, when installed over large areas, generally is not intended to provide drainage to a specific part of the compartment, except in shower stalls and within coamings where it should be sloped

toward the drain through the use of underlay. Generally, to reduce the weight of the installation, underlay for leveling the deck should be no more than 1/4-inch thick, except where sloping toward drains is necessary within coamings and shower stalls. Minimum thickness of underlay in shower stalls and within coamings should be 1/4–inch to provide additional corrosion protection.

634-3.1.2 MATERIAL. Unglazed porcelain or abrasive ceramic tiles shall be used as specified in American National Standards Institute, specification ANSI-A137.1. Tile shall contain aluminum oxide or silicon carbide abrasive, or other slip-resistant surface with a coefficient of friction of 1.0 (minimum).

634-3.1.2.1 Ceramic Tile. Tile shall be 1/4-inch thick, standard grade, in 1-inch squares, and mounted into sheets. Tile pattern shall be similar to American Olean Tile Company, Ceramic, Mosaic Pattern number P103-2129 (blue).

634-3.1.2.2 Quarry Tile. Quarry tile shall be standard grade, abrasive type, 1/2-inch thick, in 6-inch squares.

634-3.1.2.3 Porcelain Paver Tile. Porcelain paver tile shall be 6-inch or 8-inch squares, 5/16-inch thick.

634-3.1.2.4 Ceramic Tile Underlayment and Adhesive. Adhesive and grout shall be epoxy, chemical resistant, and water cleanable, according to ANSI-A118.3. Underlay material, MIL-D-3135, type I, class 2 shall be installed to a minimum thickness of 1/8-inch on the deck. Areas within an 18-inch radius of deck drains shall be sloped towards the drain. Within shower stalls and coamings, the thickness of the underlay shall be a minimum of 1/4-inch, and sloped for proper drainage. On all vertical structures, including stiffeners bounding the deck on which tile is installed, the underlay shall be coved up to a height of 4 inches and sealed with the epoxy grout to form a coved base. Ceramic tile cove base may be used in lieu of the underlay cove base.

634-3.1.2.5 Weight. Total weight of 1/4-inch underlay, ceramic tile adhesive, ceramic tile, and underlay grout is approximately 4.6 lb/ft^2 ; with quarry tile, 7.35 lb/ft^2 ; with porcelain paver tile 5.2 lb/ft^2 . Tile and underlay weigh approximately as follows:

a. Ceramic tile - 2.75 lb/ft^2 , Quarry tile - 5.5 lb/ft^2 , Porcelain paver tile - 3.34 lb/ft^2 .

b. Underlay - 1.5 $lb./ft^2$, 1/4 inch thick.

634-3.1.3 INSTALLATION (STEEL DECK). Ceramic tile installation on steel decks involves several separate steps.

634-3.1.3.1 Preparation. The deck, including the vertical bounding surface against which the trim tile will abut, should be cleaned free of rust, loose scale, and paint by abrasive blasting, wire brushing, or similar methods. Grease, oil, and other foreign matter should be removed by solvent cleaning.

634-3.1.3.2 Underlay Application. The clean, bare steel must be primed with a 2- to 4-mil dry-film thickness of formula 150, MIL-P-24441, or other NAVSEA-approved primer before installation of the underlay. Apply underlay in accordance with manufacturer’s directions. Fill in all depressions in the deck and level off underlay to 1/8-inch thick above the level of the deck with battens. Slope the underlay toward the drains within an 18-inch radius of the deck drains. Within coamings and shower stalls, the underlay thickness should be a minimum thickness of 1/4-inch, with the entire area sloped towards the drain.

634-3.1.3.3 Epoxy Tile Setting Adhesive. Epoxy adhesives are supplied as a two or more part system that must be mixed together at the time of use. Exact proportioning of the parts with one another is necessary for satisfactory cure and performance. Thorough mixing is absolutely necessary. Follow the manufacturer's directions for proportioning and mixing, including pre-mixing of separate parts before final combining, where required. Do not begin application of epoxy until the temperature of the space and substrate is above 50°F, and rising, unless specifically authorized by the manufacturer.

634-3.1.3.4 Tile Installation. Apply sufficient adhesive to the deck, using a notched trowel, to achieve an average thickness, after beating in, of 1/16-inch for ceramic mosaic tile, and 1/8-inch for quarry tile. Do not apply more epoxy adhesive than can be tiled before initial set. Epoxy that indicates a set is taking place must be removed from the deck and replaced with fresh epoxy. Temperature affects set time, and test sections should be tried before tiling large areas. Press or tamp tile into the epoxy to assure a smooth surface and proper bond. Immediately remove any epoxy that accidentally gets on the face of the tile. Allow the tile to set a minimum of 16 hours before grouting.

634-3.1.3.5 Grouting. Always refer to manufacturer's specific directions for grouting. Do not grout tile until at least 16 hours after tile setting is complete.

1. Mixing instructions as specified above for tile setting adhesive shall be followed. Force epoxy into joints using a gum rubber trowel or other suitable tool recommended by the manufacturer. Fill all joints full and even with the surface of tile or to even contour with cushion-edged tile. Use sufficient pressure and flow the epoxy in progressively to avoid air pockets or voids.
2. Before the epoxy on the surface of the tile loses its plasticity or begins to set, remove all excess material with a squeegee or rubber trowel. For final cleanup, use water and cleaning pad as specified in the manufacturer's directions. DO NOT ALLOW EPOXY TO HARDEN ON THE FACE OF THE TILE.

634-3.1.3.6 Protection. Spaces in which tile is being set shall be closed to traffic and other work. Allow 16 hours to elapse before grouting tile set in epoxy. Light traffic is not permissible until 40 hours after grouting, and heavy traffic not until after 7 days. Maintain a temperature of 60°F or higher during the curing period.

634-3.1.4 INSTALLATION (WOOD DECK). On smooth and level wood decks that have no spring, install a two-ply unpigmented polyester glass deck covering as waterproofing base for the tile. The base shall be flashed up 4 inches along the bulkhead. When the polyester-resin deck covering is thoroughly dry, lightly roughen surface (to provide a good bond for the ceramic tile adhesive) and apply ceramic tile without underlay. Underlay should be used in shower stalls for sloping toward drains. The weight of ceramic tile over polyester is 3.6 lbs./ ft^2 . In place of polyester glass, Products Research Company's polyurethane PR-1539R or equivalent may be used as combined waterproofer and cement for the tile. On springy wood deck, before the application of the polyester glass covering, securely install a 3/8–inch thick exterior or marine fir-plywood base. Bed plywood in fortified double planking cement, MIL-S-19653, National Stock Number (NSN) 8030-00-579-8890. Then proceed as above with the installation of two-ply polyester glass deck covering, or Products Research Company's PR-1539R or equal polyurethane covering.

634-3.1.5 INSTALLATION OVER EXISTING MASTIC DECK COVERINGS. Ceramic tile may be installed over terrazzo or other mastic deck covering with the following restrictions:

a. Ships with stability status one need no compensation for the additional weight.

b. Ships with stability status two or four, weight removals are required to compensate for the additional weight.

c. Ships with stability status three (stability critical) obtain compensation through additional ballast.

d. Combat ships are weight critical and shall not install ceramic tile over existing mastic deck covering.

Any installation which will result in weight addition greater than or equal to 5 tons must have prior NAVSEA approval.

634-3.1.5.1 Installation. Clean surface thoroughly with paint solvent or detergent to remove dirt and grease. If surface requires leveling, bring to a plane surface with underlay. Allow underlay to dry hard and proceed with installation as described for steel decks.

634-3.1.5.2 Repair for All Installations. Loose tiles should be removed and their backs scraped free of dried adhesive. If underlay requires repair, apply as above and allow to dry overnight. Spread adhesive on back of tile and adhere to deck. Grout as previously described for steel decks.

634-3.2 CONCRETE AND ALUMINUM DIAMOND PLATE

634-3.2.1 Concrete should consist of a mixture of portland cement and lightweight aggregate (vermiculite or pumice) and should be used in the oxygen or nitrogen generating and storage areas. It should be installed 2 inches thick and have a minimum compression strength of 1000 lb/in^2 in 28 days after installation. Aluminum plate over the concrete should be 3/16–inch thick, MIL-F-17132, pattern A or B. The underside of the aluminum shall be painted with one coat of wash primer, formula 117, and three coats of anticorrosive primer, MIL-P-52995 (see **NSTM Chapter 631, Volume 2, Preservation of Ships in Service-Surface Preparation and Painting**). The concrete shall be treated to neutralize its alkalinity before installation of the plate and given one coat of epoxy polyamide primer, formula 150, MIL-P-2444-1.

634-3.3 DOORMAT

634-3.3.1 A cocoa fiber mat, Fed. Spec. DDD-M-156, 22 inches by 36 inches, or equal should be used. An additional type of doormat that may be used in lieu of cocoa fiber is Nomad Brand matting manufactured by 3-M Co. or equal.

634-3.4 IMPACT PADS

634-3.4.1 POLYURETHANE (METAL DECKS). Install impact pads generally in accordance with Naval Air Engineering Center (NAEC) Plans 408320 and 408278 to protect the arresting wire terminal fitting from damage or breakage. Seven sections of pads were originally installed to accommodate jet plane arrestments. The pad sections consist of 3/4-inch thick polyurethane, factory bonded to 1/4-inch thick medium steel. Pads can be requisitioned from the Ships Parts Control Center (SPCC), Mechanicsburg, Pennsylvania, under FSN-2H-2040-814-5903. The sections under this stock number are 18 inches wide by 4 feet long with an additional 2 inches of steel extending beyond the polyurethane on both 18-inch sides. All bare metal on the deck and pad should be coated with two coats of zinc chromate primer or epoxy primer formula 150 of MIL-P-24441 and all faying surfaces should be given a heavy coat of thick film rust preventive compound, MIL-C-11796, Class 1, or MIL-C-16173, grade 1. The sections are slid into a steel retaining frame (aluminum frame on aluminum decks) which is welded to the deck on three sides. The fourth side (generally, the 18-inch outboard side) is bolted to the deck for easy removal so that worn sections can be moved to a less damaging outboard position or replaced more easily.

634-3.4.2 BUTYL RUBBER (WOOD DECKS). Install impact pads generally in accordance with NAEC Plans 504850, 504834, and 504835. Three sections are used. Each section is 36 inches by 52-7/8 inches by 3-1/8 inches. This item is in standard stock under FSN-1H-2040-055-1128 and should be requisitioned through SPCC, Mechanicsburg, Pennsylvania. After installation, all joints should be sealed with polysulfide or rubber polyurethane caulking compound (see paragraph 634-4.1). The steel pan beneath the impact pads should be given a thick coating of rust preventive compound. Polyurethane impact pads may be used in place of the butyl rubber.

634-3.4.3 REPAIR. To extend the service life and improve appearance of these pads, gouges can be repaired as described in subparagraphs below. However, the suitability of making a repair must be determined by visual and qualitative examination. If chunks of rubber can be readily removed with a screwdriver or the resiliency of the rubber is lost, the pads will not be suitable for repair.

a. **Cleaning.** The cleaning operation is the most important step to obtain good adhesion between the pad and the repair compound.
   1. Scrape and wipe oil, grease, and foreign matter out of gouges and off the surface.
   2. Scrub vigorously with a fiber brush and detergent solution to remove residual grease and salt deposits. Flush with fresh water. Allow pads to dry, blowing off excess water with air. Solvent cleaning may also be used. Roughen surface before patching.

b. **Precautions.** Repair compounds recommended below are two-component systems and the curing time is affected by temperature. Repair should not be attempted below 60°F unless warming of the repair areas can be accomplished with hot air or infrared heat lamps to accelerate curing. Repair should also not be attempted during rainy weather. If repair is absolutely necessary during cold and inclement weather, pads should be removed to an interior space. Manufacturer's directions for mixing must be closely followed.

634-3.4.3.1 Polyurethane. There are two methods of applying polyurethane.

a. **Method A.** Use a polysulfide compound, MIL-C-18255, type I, over a primer, PR-1099, Products Research Co., Burbank, California 91504. Allow 16 hours of primer drying time before filling holes with the repair compound. Patching is accomplished by troweling on compound, leveling off and pairing around edges of damaged area. Allow approximately 48 hours time before using pad.

b. **Method B.** Use a polyurethane repair compound without a primer. Repair compounds are: PR-1535, manufactured by Products Research Co., Burbank, CA 91504; PR-1539, manufactured by Products Research Co., Burbank, CA 91504; Coast Pro-Seal 794, manufactured by Coast Pro-Seal Manufacturing Co., Los Angeles, Calif. 90054; or equivalent materials. Compounds of PR-1535, PR-1539, and Pro-Seal 794 are normally liquid. If the hardener has solidified in storage, it must be liquefied. To liquefy hardener, warm compound with steam or hot water to 200 + 10°F, unless otherwise directed by manufacturer. Stir occasionally during heating until liquid. Let hardener cool to 70 to 80°F before combining with base compound. Mix with mechanical stirrer for 5 minutes. This compound absorbs moisture for curing from air so keep cans closed until ready for use. Avoid contact with skin, eyes, and respiratory system. In case of contact with skin, wash affected area with soap and water. The mixed compound should be troweled onto the damaged pad, leveled out, and faired around the damaged area. Protect from rain and allow a minimum of 48 hours before putting pad into use.

634-3.4.3.2 Butyl Rubber. Procedure is as follows:

a. **Repair compounds.**
   1. Primer — None

2. Compound — Polysulfide rubber caulking compound MIL-C-18255, type I.

b. **Mixing.** Mixing of MIL-C-18255, type I, requires thorough blending of the brown accelerator with the black base compound. Do not mix until ready to use. Stir the brown accelerator in its container until a smooth creamy consistency is obtained. Add the brown accelerator to the black base and mix with a mechanical stirrer 5 to 7 minutes. The mixing container's sides and corners should be continually scraped to assure that no unmixed accelerator remains. The brown accelerator is a lead compound. In case of contact with skin, wash with soap and water.

c. **Patching.** The mixed compound is troweled onto the damaged pad, leveled out, and faired around the damaged areas. Protect from rain. Allow to cure 48 hours before putting pad into use.

634-3.5 POLYESTER RESIN AND GLASS CLOTH (GRP)

634-3.5.1 GENERAL. The construction of the upper levels of minesweepers is either conventional caulked decking or a plywood sheet butted at frames. Frequently, the decking shrinks due to improper installation, and repeated efforts to recaulk do not prevent leaks. Similar leaks occur at the seams of plywood construction.

1. Polyester resin impregnated glass cloth coverings installed over the wooden decks can prevent leaking. In addition to preventing leaks, the coverings provide durable surfaces that need little maintenance.
2. Where extensive deck leaks occur and ordinary recaulking is not effective in stopping leaks, decks may be covered with the polyester resin glass cloth in accordance with instructions provided herein.
3. For decks that become quickly worn and require relatively frequent repair, polyester resin glass cloth may be applied where resulting savings in repair costs justify the expense of application.

634-3.5.2 INSTALLATION. The materials required are not carried in standard stock and should be ordered as needed. Polyester resins have a shelf life of about one year and should not be ordered in larger quantities than can be used in that time.

634-3.5.2.1 Material. A general purpose polyester conforming to MIL-R-7575, grade B, class 0, should be used as the laminating resin with a glass cloth conforming to MIL-C-9084, type VII, plain weave. However, equivalent type materials may be substituted. The following is a list of potential suppliers:

a. **Polyester resin** . Order with catalyst and accelerator provided by supplier.
   1. Laminac 4110 - American Cyanamid Co., Plastics and Resin Division, 30 Rockefeller Plaza, New York, New York 10020.
   2. Marco 28C - Celanese Corporation of America, Marco Prod. Department, 290 Ferry Street, Newark, New Jersey 07105.
   3. Polylite 8027 - Reichold Chemicals, 630 Fifth Avenue, New York, New York 10020.
   4. Selectron 5003 - Pittsburgh Plate Glass Co., Paint Division, Milwaukee, WI 53201.
   5. Vibrin 153 - Naugatuck Chemical Co., Division of U.S. Rubber Co., Naugatuck, CT 06770.

b. **Glass cloth** . In procuring glass cloth, it is essential to specify Volan, Silane, or Garan treated woven glass cloth.
   1. HG #63 - Hess Goldsmith and Co., Inc., 1400 Broadway, New York, NY 10018.
   2. Thalco #1534 - Thalco, 765 S. Harvard Blvd., Los Angeles, CA 90005.

3. Trevarno Boat A - Coast Manufacturing and Supply Co., Livermore, CA 94550.
4. United Merchants #1000 - United Merchants Industrial Fabrics Corp., 1412 Broadway, New York, New York 10018.

c. **Gray pigment** --Formula 202, FED-STD-595A, number 36231.

d. Tools required are scales or measures for accurately proportioning ingredients, paint brushes, rollers, buckets, power sander, sanding blocks, scrapers, scissors, rubber squeegee, and a sharp knife. Acetone or lacquer thinner and soap and water can be used for cleaning equipment. The quantity of materials required for covering a deck is based on the following: area of deck, spreading rate of resin (about 1 pint per square foot per coat) and two plies of glass cloth.

634-3.5.2.2 Surface Preparation. The deck shall be cleared of any abrasive deck treads or sheet metal. Deck installations that indicate leakage should be removed where practicable. The deck shall then be sanded with an open-grit, coarse-disc sander. Paint must be removed and the wood surface must be dry and absolutely clean. Paint removers and torches should not be used. Any oil or grease spots must be removed by scrubbing with a strong detergent in hot water and then washing with fresh water. Fill all holes, dents, gouges, and wide cracks with a wood filler that sets to a hard surface. Duratite or similar plastic compounds are satisfactory. Oil base putties must not be used. Old caulking or filler compound, if hard and in good condition, is satisfactory, but if it is loose, it must be removed and replaced with new filler. When filler is dry, sand down, flush with the surface. The surface of the wood must be dry before applying coating. Surface moisture should be less than 15 percent.

634-3.5.2.3 Resin Preparation. The polyester resin is supplied as a clear syrup-like liquid. An accelerator and a catalyst must be added to the resin in order for the resin to cure or harden. The quantity of accelerator (cobalt naphthenate) and catalyst (MEK peroxide) to be used will depend upon the working temperature and reactivity of the resin. The quantity used will determine the resin's pot life (time to harden). Follow the manufacturer's instructions carefully. Because the accelerator and catalyst will react violently if mixed together, they must be added to the resin separately. Add the accelerator first. For all pigmented coats, mix the pigment into the resin before adding accelerator or catalyst.

634-3.5.2.4 Application. There are two methods for applying resin-glass cloth.

1. The first method consists of applying a brush or rolled coat to the prepared wood. The glass cloth is then spread smoothly over the primed area and another coat of resin is applied. After this coat cures, it is lightly sanded and a third coat of resin is applied, followed by a second layer of glass cloth. Subsequent coats of resin are then applied. Curing time allowed between each coat of resin should be not less than 16 hours. The resin above the top layer of glass (except under ceramic tile) shall be pigmented; for interior decks, use a green color similar to FED-STD-595, number 14110; for the shower stall, use a light green color, similar to No. 14491. The polyester glass shall be flashed up on interior bulkheads to a height of approximately 6 inches. In shower stalls, the covering shall be applied directly to the structure to avoid dead air spaces.
2. The second method recommended is known as the shingle method. Two layers of glass cloth are applied without waiting for the resin to cure, and sanding between coats is avoided. The procedure is as follows:
   a. The covering is to be laid with the seams of the cloth parallel to the centerline. A heavy coat of the catalyzed resin is applied by brush or roller to the prepared area for the first strip of cloth (half-width). A strip of half-width glass cloth is immediately laid in place and squeegeed down. Some resin will come through in smoothing the cloth, but additional resin is spread to bond the second layer of cloth. The area of the next strip is coated with resin. A second layer of full-width glass cloth is laid, covering the cloth preceding and extending onto the prepared deck. Subsequent strips of full-width cloth and resin are then applied with each piece lapping halfway over the piece ahead. Air bubbles should be worked out by using a squee-

gee to completely impregnate the glass cloth with resin. At deck edges, the cloth is run down 2 inches over the edge. Glass cloth should be butted, not lapped, to the deck house and deck installations that were not removed.

b. After the laminated deck covering cures (not less than 16 hours), it is lightly sanded. Deck fittings and installations that were removed are reinstalled and bedded in double planking cement, MIL-S-19653. Double planking cement also is applied to waterproof seams of butted edges along deck house and deck fittings that were not removed. An additional coat of pigmented resin is then applied. To obtain a non-skid surface, foundry sand having a screen size of about 50 mesh is sprinkled on the walkways while the pigmented resin coat is set. When the resin cures, excess sand is then swept away. A final coat of pigmented resin may be applied to improve the deck appearance. As an alternative, abrasive deck treads, MIL-D-17951, may be installed in walkways or a slip-resistant deck covering as described in paragraph 634-3.24 may be used.

634-3.5.3 REPAIR. Damaged sections in the reinforced plastic covering can be repaired by patching. The repair process involves the preparation of the damaged section by cutting away loose or jagged areas, sanding, and applying a patch of glass cloth and resin. Repair kits with instructions for use by ships force are available from stock: Repair Kit IH-2090-372-6064.

634-3.5.4 SAFETY PRECAUTIONS. When using resins, accelerators, catalysts, and flammable solvents for cleaning, all precautions and safety measures pertaining to flammable materials such as no smoking, welding or burning in the immediate areas shall be enforced. The use of rubber gloves during application of resin and glass cloth is deemed advisable.

634-3.6 RESILIENT ROLL OR SHEET AND FIRE-RETARDANT DECK TILE

634-3.6.1 GENERAL. Tile, roll, or sheet deck materials shall be installed over wood or plastic decks, or over metal decks that have been prime-coated with epoxy formula 150 of MIL-P-24441 or other NAVSEA-approved primer. Where necessary to level or slope the deck, to level fair welded seams, or to fill in depressions, underlay conforming to MIL-D-3135 shall be applied over the primed deck. Deck tiles and sheet material shall be cemented to the metal deck, over the primer or underlay, with latex adhesive, MIL-A-21016. However, in damp or wet areas an epoxy type adhesive, MIL-A-24456 or equivalent, should be used. Tiles or sheet shall not be installed more than two layers thick because of the increased fire hazard. They may be installed over one existing layer provided that the existing material is well adhered to the deck and that gouges and worn areas are first repaired. Immediately after tile or sheet is installed, the deck should be rolled thoroughly in both directions with a 150-pound sectional roller to ensure adhesion. For safety precautions in ripping out and handling vinyl-asbestos tile, refer to the appendixes in **NSTM Chapter 635, Thermal, Fire, and Acoustic Insulation** .

634-3.6.2 MATERIALS. The following fire-retardant deck covers are approved for use as indicated:

a. **Fire Retardant Plastic Deck Tile** . Deck tiles shall conform to ASTM F-1066.

b. **Rubber Deck Tile and Rubber Sheet Materials** . Vinyl or rubber deck tile is approved only for use on wood or plastic hull boats and ships. Rubber tile and sheet materials shall conform to FED SPEC SS-T-312, type II, with one exception: sheet material is exempt from dimensional requirements, because it is available in widths of 36 inches, minimum. Both rubber tile and rubber sheets are required to meet the fire standards of MIL-STD-1623 and both are required to be 1/8-inch thick for maximum durability.

c. **Homogeneous Vinyl Tile** . Vinyl deck tiles shall conform to FED SPEC SS-T-312, type III, and shall be 1/8-inch thick for maximum durability. Tile must conform to MIL-STD-1623.

d. **Vinyl Floor Covering with Backing** . Vinyl deck covering with a backing, FED SPEC L-F-475, grade A, or ASTM F1303, Grade 1, meeting the fire test requirements specified in MIL-STD-1623, may be used for general shipboard applications in lieu of deck tile. In mercury handling spaces, vinyl sheet shall be coved up the bulkheads to form a 2- to 4-inch base coving; seams must be fused either chemically or with a heat gun.

e. **Electrical Grade Mat and Sheet** . Use MIL SPEC MIL-M-15562 in electrical/electronic spaces for personnel protection against accidental electrical shock. Electrical grade sheet, rubber, or plastic, type I of MIL-M-15562 is acceptable for general shipboard use and may be substituted where deck tiles are specified.

634-3.6.3 INSTALLATION. Immediately prior to installation, all deck covering and adhesives shall be stored for at least 24 hours at a temperature of 21°C (70°F) or higher. Spaces shall be maintained at a temperature of at least 21°C (70°F) prior to, during, and 24 hours after installation is completed. A beading sealer MIL-D-17951 (NSN 9Q 8030-00-264-3886), silicone sealer MIL-A-46106, type I, or polysulfide sealant MIL-S-8802, class B shall be used to waterproof all seams against bulkheads, stationary furniture, pipes, and other deck fittings. Where weld lines (beads) prevent deck covering from butting tightly against structure, caulking compound, MIL-C-18255 must be used in place of tile adhesive and should be painted to blend with the deck tile or bulkhead (after the caulking compound skins over); alternatively, the weld line against bulkhead may be faired with the underlay and the tile butted against the bulkhead. The latter method presents a better appearance. If desired, the tile may be squared off adjacent to vertical stiffeners and stanchions.

634-3.6.3.1 Preparation of Steel Decks. Steel decks must be clean and free from oil, grease, rust, and loose scale. It is not necessary to remove primer or deck paint if well bonded to deck; otherwise, loose paint, rust, and scale should be removed by blasting, wire brushing, or other effective method. The deck shall then be washed with paint thinner to remove grease and contaminants, and primed with formula 150, MIL-P-24441, 2- to 4-mils dry-film thickness. If possible, weld seams should be ground flush with the deck, and all low spots should be filled with underlay, MIL-D-3135, type II. High spots should be ground down, if possible, or faired with underlay before applying the primer. The deck must be dry at the time the deck covering is installed.

634-3.6.3.2 Preparation of Wood Decks. Wood decks must be clean and free from oil and grease. Remove paint that is not well bonded to the wood by sanding. Dull paint and varnish films by light sanding. Fill cracks and dents with underlay. Cover all wood decks with asphalt-saturated lining felt. Lay the felt across deck planks and butt all joints (do not lap). After the felt sheets are fitted and cut fold half of each sheet back on itself (one sheet at a time) and spread adhesive on deck with a fine-notched trowel. Starting at the fold back, do about 36 square feet at a time. Embed the felt in the paste immediately. Roll the felt in both directions. Repeat this procedure for the second half. To avoid skinning over and poor adhesion do not spread the adhesive too far ahead . The same procedure is applicable for laying sheet linoleum.

634-3.6.3.3 Application of Deck Tile. Pointers for laying vinyl asbestos, rubber, and vinyl tile are as follows:

a. Prior to installation, tiles should be stored for 24 hours at a minimum temperature of 21°C (70°F). At temperatures below 21°C (70°F) the material is not sufficiently flexible for satisfactory installation. To ensure straight seams, areas to be covered should be squared off and, if practicable, the installation of tile should be started at the center of the space and worked to the edges to achieve an even balance of tile around edges of the space.

b. If a pattern of two or more colors is desired, plan this on graph paper in advance (each square of the paper can be considered one tile). For spaces with nonparallel opposite bulkheads, use a large square and chalk line

at corners to square off the compartment into a rectangular or square layout. To locate the center of the space, strike a chalk line from midpoints of opposite bulkheads after squaring off.

c. It is important that installation start at sections of the space where work can proceed to completion without kneeling on freshly laid tile. Cement conforming to MIL-A-21016, or as otherwise specified, should be spread with a fine-toothed trowel (approximately 1 square yard at a time) at a coverage rate of 100 square feet per gallon (excess cement will reduce adhesion). While the cement is tacky, the tiles should be forced into tight contact with each other. Each tile should be flexed downward slightly saucer-wise so that the four corners hit the deck first. (The roller takes care of bringing the center into the cement.) Half tiles can be cut by scoring and cutting through with a sharp knife. A dull or unpointed linoleum knife should not be used for tile cutting because the cut edges will be uneven. Care should also be taken that the cement does not get on tile surfaces; excess wet cement may be cleaned off with a damp rag; excess dry cement with a rag wet with paint thinner. Pressure should be applied to ensure complete contact of each tile with the deck. Any high joints remaining after this operation should be rubbed even and smooth with the head of a hammer or a hand roller.

d. Installations should be made bulkhead to bulkhead, or squared off adjacent to stiffeners and stanchions. Where an exposed edge fails to butt up against a fitting or bulkhead, a stainless steel or brass strip (1 inch by .08 inch) should be screwed, cemented (with epoxy or polysulfide adhesive), or welded to the deck to protect the edge. A vinyl-asbestos, beveled-edging strip (cemented to the deck with rubber latex cement) may also be used.

e. Travel over the newly cemented areas should be restricted until the installation is completed; thereafter the deck can be opened to foot traffic immediately, since no indentations will result from this type of traffic. However, it is recommended that heavy concentrated loads, such as legs of heavy furniture, be kept off the deck until the cement has set (approximately 18 hours). Water can affect adhesive and loosen tiles; therefore, the deck should not be swabbed for 1 week after installation. Thereafter, for general cleaning, water should be used sparingly to prevent corrosion under tiles.

634-3.6.3.4 Installation of Rubber Roll, Vinyl Sheet, or Mat. When installing these materials in front of equipment only, cut the sheet to the desired length and, with a straight edge, cut off the selvage (if applicable) before cementing the sheet. When installing sheeting material over an entire deck area, lay out the material, cutting all sheets to the desired length; then overlap sheet edges so that all seams can be double cut, using a straight edge, to assure tight fit. After the material has been cut and fitted, roll sheets back and cement half the area; then repeat the process for the other half.

1. When cementing, use a latex-type adhesive conforming to MIL-A-21016, or other adhesive recommended by the manufacturer. If the sheet has a tendency to bubble or lift after installation, a stronger adhesive should be used for subsequent installations. Use an epoxy adhesive such as AMTICO NO. 529 (American Biltrite Company), MILLMARK No. 7 (Mastic Tile Rubberoid Corporation) or other NAVSEA-approved equivalent. Spread the adhesive with a notched trowel, making certain that the entire surface is covered. When the adhesive is tacky, install the sheet. Immediately after installation thoroughly roll the deck in both directions with a 150-pound sectional roller.

2. For additional information concerning materials used to prevent electric shock, refer to paragraph 634-3.12.

634-3.6.3.5 Repair or Replacement of Deck Tiles. If a tile requires replacement, remove by forcing a wide-blade paint scraper under it. Inspect for corrosion. Chip out the dried cement and corrosion products to bare steel, clean the spot with paint thinner, coat with primer, and install tile as previously described.

634-3.7 LATEX UNDERLAY

634-3.7.1 GENERAL. Latex underlay should conform to MIL-D-3135, Type I, class 1, or Type II, class 1 (NSN 9C 5610-00-141-7958 and 9C 5610-00-141-7959).

634-3.7.2 SURFACE PREPARATION. Remove rust and paint. Clean deck free of oil, grease, and dirt with an approved degreasing solvent such as type II of FED SPEC P-D-280 (NSN 6850-00-274-5421, 5 gallons, or 6850-00-110-4498, 1 pint). Apply one coat of epoxy primer, formula 150, MIL-P-24441, 2- to 4-mils dry film thickness, in accordance with **NSTM Chapter 631, Volume 2, Preservation of Ships in Service-Surface Preparation and Painting.**

634-3.7.3 SURFACE WETTING COAT. One part rubber latex mixed thoroughly with 2 parts underlay powder (both by weight) should be brushed on in a thin coat, assuring that the entire deck is thoroughly wet. The purpose of the wetting coat is to assure that the underlay bonds securely to the surface.

634-3.7.4 UNDERLAY BODY COAT. Mix thoroughly (by weight) 1 part rubber latex, 1-1/2 parts of underlay powder, and 1-1/2 parts underlay aggregate. Mix only in such quantity that the material will not set up before application. Make certain there are no dry particles left. The following approximate quantities of materials are required to cover 100 square feet (1/4-inch thick):

a. Forty-nine pounds rubber latex

b. Seventy-three pounds underlay powder

c. Seventy-three pounds underlay aggregate.

634-3.7.4.1 While the surface wetting coat is still wet, trowel on the underlay body coat and level off with battens. After leveling off, go over the surface with steel trowels, working down hard to flow the mix together and to blend it with the surface wetting coat. Allow to dry hard (at least 2 days) before application of deck covering. If the underlay is used in excess of 1/2-inch thick in one layer, it will tend to develop hairline cracks. Latex underlayment for use under deck tile and resilient sheeting should conform to MIL-D-3135, type II, and should be installed in accordance with the manufacturer's directions. Type II can be feather-edged and troweled to a smooth finish without sanding.

634-3.8 EPOXY TYPE UNDERLAY

634-3.8.1 GENERAL. Epoxy underlay shall be installed over primed steel decks in accordance with manufacturers instructions. Epoxy type underlay shall conform to MIL-D-3135, type I, class 2 or type II, class 2 for use under resin terrazzo, cosmetic polymeric deck covering, and ceramic tile.

634-3.8.2 INSULATION TYPE UNDERLAY. Insulation underlayment may be used to prevent condensation in certain areas, e.g., above ballast tanks and hot machinery spaces, especially where these decks form the deck tops of living spaces. Magnesia insulation shall conform to MIL-D-23134.

634-3.8.3 SURFACE PREPARATION. Remove rust, dirt, old paint, oil, and grease from the deck. Clean up all traces. Apply one coat of epoxy primer, formula 150, MIL-P-24441, or other NAVSEA-approved primer, 2- to 4-mils dry-film thickness.

634-3.8.4 INSTALLATION. The on-deck magnesia insulation shall be troweled smooth, a minimum of 1-inch thick over rough finish latex underlay (MIL-D-3135, type I), installed at least 1/8-inch thick. Exposed aluminum fittings shall be protected from corrosion by the magnesia by either a coating satisfactory for aluminum (**NSTM Chapter 631**), or a suitable covering such as wrapping with a vinyl tape.

634-3.9 MASTIC

634-3.9.1 GENERAL. Latex mastic (MIL-D-3134, type II, class I) deck coverings specified herein is to be installed over the entire deck except where built-in equipment interferes. They are intended to protect the deck and to facilitate cleaning and maintenance. However, where appearance is of prime importance, mastic and magnesite are not recommended. Because of their solid color, mastic and magnesite have poor soil-hiding capability and tend to emphasize the presence of dirt and soil films. When installed over large areas, they are generally not intended to provide drainage to a specific part of the compartment (in order to keep the weight down) except in the vicinity of drains, in shower stalls, within coamings, and in inaccessible areas where they should be sloped toward the drain. Underlay may be used to facilitate drainage in other areas where drain location makes it necessary. If required for fairing or leveling in certain areas, install latex underlay, MIL-D-3135, type I (NSN 9Q 5610-00-141-7958 and 9Q 5610-00-141-7959). Mastic is a trowel-applied material packaged in the form of liquid latex (in cans) and aggregate and dehydrating powder (in bags). Materials must be procured from suppliers on the Qualified Products List (QPL), but not in excess of a 6-month supply (including all top coats and sealers, as required). Components are mixed at time of application, resulting in a mastic consistency suitable for application with a steel trowel. The thickness required is 1/4 inch, which weighs approximately 2.4 pounds per square foot. Latex compositions applied in excess of 3/4-inch thick in one layer may tend to develop hairline cracks on curing. A 2- to 4-inch cove shall be installed in interior spaces. Unless otherwise specified, the interior color is green. To avoid differences in color and to ensure compatibility, components from a single manufacturer should be used in each separate compartment. This deck covering should not be painted.

634-3.9.2 APPLICATION. For those ships that can tolerate additional weight (except combatant ships), MIL-D-3134, type II mastics can be used to resurface old and worn deck coverings (magnesite, terrazzo, concrete, and ceramic tile) to avoid complete removal of the existing deck covering. Any loose tile or pieces of decking must be removed. Oil, grease, wax, sealer, paint, and other foreign matter must be cleaned thoroughly from the deck covering before application of new topping. The deck covering is then applied approximately 1/8-inch thick in the normal manner as described herein.

634-3.9.2.1 Material. Materials required are as follows:

a. **Latex** - 9Q 5610-00-542-3171

b. **Aggregate** - 9Q 5610-00-542-3175 (green)

c. **Grout powder** - 9Q 5610-00-542-3176 (green)

d. **Pigmented topcoat** - NSN 9Q 5610-00-542-3173 (green)

634-3.9.2.2 Surface Preparation. Decks should be wire brushed to bright metal and primed with 2- to 4-mils dry-film thickness of formula 150, MIL-P-24441, or other NAVSEA-approved primer, according to **NSTM Chapter 631, Volume 2** . On older decks, where the decking is retained, the surface should be cleaned free from dirt and grease and mechanically roughened.

634-3.9.2.3 Mixing Instructions. The mixing and application instructions provided herein are to be used only for guidance or if no other instructions are provided; otherwise, the mixing and application should be in accordance with the manufacturer's directions. Mastic should not be applied in spaces where the temperature is below freezing. Application is also difficult if the deck temperature is above 24°C (75°F), because the material will tend to dry too rapidly.

1. Pour 1 gallon of paste into a clean 5-gallon pail. Then add exactly one-half bag of grout powder (approximately 18 pounds). Blend these materials thoroughly by stirring with a paddle until the mixture is completely homogenized and free of lumps. This blend is known as the surface wetting mix. This material is sufficient to cover 100 ft^2 and will remain workable for about 1 hour. Fresh water will clean tools if they are washed immediately after using.
2. Set aside the surface wetting mix and prepare the body coat in the following manner: Pour 1 gallon of paste into the mixing trough. Then add one bag of aggregate. Thoroughly blend these materials by turning them over with a hoe. The body coat will become a homogeneous mass, free of lumps or dry material. The above quantity is sufficient to cover 25 ft^2 to a 1/4-inch thickness and will remain workable for about 1 hour. Freshwater will clean tools if they are washed immediately after using.

634-3.9.2.4 Installation. Pour a small amount of surface wetting mix onto the deck and, using a paint brush, paint an area of about 8 ft^2 with a thin uniform coating. The body coat must be troweled onto the surface wetting mix while the latter is still wet. The body coat should be applied in 1/4-inch thicknesses. When troweling, the following procedures should be used:

1. Place the material by edge troweling. Hold the trowel at a 45° angle in the direction of trowel motion.
2. Immediately after placing a few feet of material, smooth by lightly troweling with the trowel held almost flat. Care should be taken that this smoothing operation is done quickly and with a minimum of retrowelings, because the quick setting of the material will not permit repeated trowelings.

634-3.9.2.5 Grouting. Allow the body coat to dry for 24 hours, then sand off all trowel marks using medium-grit sandpaper on a sanding block. Sweep the surface free of any dust with a soft bristle broom. Wash spilled oil or dirt from the surface with a minimum amount of freshwater.

1. The grout coat is applied to smooth off the body coat. Mix the grout by pouring 1 gallon of paste into a clean 5-gallon pail. Then add exactly one-half bag of grout powder (18 pounds). Blend these materials thoroughly with a paddle until the mixture is completely homogenized and free of lumps. This blend is sufficient to cover 160 square feet in one coat and will remain workable for about 1 hour.
2. Pour a small quantity of the grout onto the surface and scrape, troweling the grout over the surface. The grout coat should just fill in the pores of the body coat and should not develop any thickness on top of the body coat.
3. Allow the grout to dry for at least 4 hours; apply a second coat, if needed. After drying, sand off any trowel marks using a fine grit sandpaper (allow 24 hours before sanding).

634-3.9.2.6 Cove Base. A ground strip should be installed at the specified height along the bulkhead and used as a finished height by the applicator. The cove mix is then installed in the normal manner as outlined above, with the thickness a minimum of 1/8 inch. Mix is kept drier than for decks.

634-3.9.2.7 Pigmented Topcoat. The surface should be vacuumed or swept clean of any dirt and dust and must be absolutely dry. **DO NOT WASH** . The pigmented topcoat shall be applied in at least two coats. The material must be stirred thoroughly and must be kept stirred during use. Coverage is approximately 250 square feet per gallon. The material may be applied with a brush or paint roller and should be spread on liberally, not brushed in or rolled thin. Drying time for each coat is approximately 6 hours. The dried surface will appear as a flat finish with uniform color. The deck covering must be cured for 2 days before being exposed to excessive traffic. However, if the deck covering will be flooded with hot water (as in shower stalls), it should be protected from exposure or use for 1 week. To enhance the performance of the mastic system, the surface should be sealed after the topcoat has been permitted to cure for at least 24 hours.

634-3.9.2.8 Sealer. Following topcoat application and periodically thereafter, the deck shall be sealed with two thin coats of a water-based sealer, MIL-S-24522, see Table 634-3-1.

Table 634-3-1. SEALER

NSN	GALLON
Q9 8030-00-007-8333	1
Q9 8030-00-007-8334	5

634-3.9.2.8.1 The periodic use of the standard maintenance sealer will enhance cleaning ease and the luster level. Application frequency will depend on the wear (traffic patterns) and the appearance desired. Always apply the sealer in several thin coats rather than in a single heavy coat. Dampen mop, sponge, or squeegee with cold water, wring out excess water, and dip in sealer. Apply in light, even coats; keep each coat thin, and be certain to cover the entire area to avoid open spots (holidays). The sealer dries and is ready for recoating in about 30 minutes. In areas of heavy traffic, additional coats of sealer should be applied.

634-3.9.2.9 Precautions. During application of mastic, the following precautions should be observed.

1. Do not allow the paste to freeze. Freezing may coagulate the paste. If the paste is frozen, allow it to thaw out slowly at room temperature. Do not heat paste to speed up rate of thaw. Do not apply if temperature in space is below freezing.
2. Do not store the paste near a heater or in any area where it might become heated above 32.2°C (90°F). Do not apply to surfaces hotter than 32.2°C (90°F).
3. Never add water to any materials.
4. Use only the mixing proportions specified in the previous paragraphs.
5. Freshwater will clean tools and buckets if they are washed immediately after using.

634-3.9.3 CLEANING AND MAINTENANCE. Mastic deck coverings should not be cleaned with lye or other strong alkali cleaning compounds.

a. **Cleaning** . Use a detergent solution of approximately 1 ounce of detergent (NSN 9G 7930-00-249-8036) per gallon of warm freshwater. Swab on cleaning solution and allow to remain on deck about 5 minutes. Scrub and mop up. Use clean water for final mopping.

b. **Resealing** . Periodic resealing will be necessary to revitalize color. Reseal with sealer (see paragraph 634-3.9.2.8).

c. **Resurfacing** . When surface becomes rough or worn, it should be regrouted (see paragraph 634-3.9.2.5). All grease and other foreign matter must be thoroughly cleaned from the existing surface.

634-3.9.4 GENERAL INFORMATION. It is necessary to gain experience with the application of latex mastic in order to judge accurately how much can be troweled in a given period of time and, hence, how much should be poured on the deck ahead for troweling. Until this is learned, the amount poured out may be excessive, and, consequently, some mastic may become partially dried before it is reached with the trowel. Also, even in normal troweling, because of the squeezing action of the trowel, some emulsion is forced out of the mix ahead of the trowel, so that there is some small residue of material containing insufficient emulsion. It is relatively easy to observe when a small amount of material has become too dry. When this condition is observed, no attempt to trowel the dry mastic should be made because a material failure may result from the lack of emulsion. When it becomes evident that some of the material is too dry, it is imperative that this material be discarded. There is no way to reactivate this material, and such attempts shall not be made. The information presented herein is for general guidance only, and should any conflict arise between this document and the manufacturer's specific instructions, the manufacturer's instructions will take precedence.

634-3.10 TERRAZZO

634-3.10.1 GENERAL. Terrazzo is defined as a composition material, poured in place or precast, and used as a deck covering. It consists of marble chips, seeded or unseeded, with a binder or matrix that is cementitious, noncementitious, or a combination. The terrazzo is poured, cured, and then ground and polished to expose the marble chips at the surface. Terrazzo shall be used only for repair of existing installations. Where complete replacement of terrazzo deck coverings is required, use cosmetic polymeric deck covering material.

634-3.10.2 LATEX-TYPE TERRAZZO. Latex-type terrazzo, MIL-D-3134, type I, class I, is a trowel-applied material containing white or colored marble chips. It is packaged in the form of liquid latex (in cans) and aggregate and powder (in bags). Components are mixed at time of application resulting in a mastic consistency suitable for application with a steel trowel. The specified thickness for application is 1/4 inch, which weighs approximately 3 lb/ft^2 . This decking may be applied to a maximum thickness of 1/2 inch without sagging of the wet mix. For greater thickness, first apply latex underlay conforming to MIL-D-3135, type I, class I. A 2- to 4-inch high cove of terrazzo, type I, should be installed. After application, latex-type terrazzo requires machine-grinding to provide a smooth surface.

634-3.10.2.1 Material. Required materials (by National Stock Number) include the following:

a. **Latex Emulsion** - NSN 9Q 5610-00-285-1458 .

b. **Terrazzo Mix** - NSN 9Q 5610-00-285-1455 .

c. **Grout** - NSN 9Q 5610-00-285-1457.

634-3.10.2.2 Surface Preparation. The deck, including the vertical bounding surface against which the coving will abut, is cleaned to bright steel by blasting, wire brushing, or similar method and given a solvent wash with an approved solvent such as 1.1.1 trichloroethane. Allow surface to dry completely. The steel is then primed with epoxy primer, formula 150, MIL-P-24441, 2- to 4-mils dry-film thickness (**NSTM Chapter 631, Volume 2**). If using MIL-P-24441 primer, allow surface to dry completely before application of the terrazzo. If using the manufacturer's primer, apply according to manufacturer's instructions.

634-3.10.2.3 Application. Mix, apply, grind, and seal in accordance with manufacturer's specific instructions. The final product should be nonporous, smooth, and free of pits, spalls, and crevices. The marble chips should be uniformly distributed, firmly embedded, and exposed at the surface. Divider strips, if installed, shall be set in accordance with the selected layout while the underbed is still plastic. Set strips straight to lines and at the proper level to ensure that the tops of strips will show uniformly after grinding and finishing operations. Fit end joints and intersections tightly. Where divisions in field work are not shown, divide field work into uniformly-sized squares or rectangles no more than 6 feet on a side. Place edging strips where terrazzo abuts other types of deck covering at doorways. Install expansion strips at control joints, construction joints, and expansion joints. Allow deck covering to cure for the amount of time recommended by the manufacturer, grind or finish as specified, and remove all residual material.

634-3.10.2.4 Restoration of Color to New, Unsealed Surfaces. To restore the deck covering color, lightly sand with No. 0 steel wool or No. 60 sandpaper. In some cases, a light mechanical sanding may be necessary to bring out the original color. Vacuum thoroughly to remove dust. Brush on two or more thin coats of sealer to preserve (allowing a minimum of 2 hours drying between coats). Keep traffic off the deck until thoroughly dry.

634-3.10.2.5 Sealing. Sealing consists of applying a thin, clear sealing liquid conforming to MIL-S-24522 or equivalent over the entire terrazzo surface, usually in several coats, to provide a nonporous film which acts as a barrier against the buildup of moisture, dirt, and grime. Acrylic latex sealers are supplied with latex-type terrazzo. If the surface is maintained by periodic resealing, colors remain bright and attractive indefinitely, and the deck is protected against excessive wear and deterioration. Deterioration can result when water and moisture are permitted to penetrate the terrazzo surface and rust the steel substrate, undermining the entire deck structure.

a. For new installations, at least two coats of sealer are required as a final surface; in some cases three or more coats may be required. These should be applied by the installing activity. Typically, a rubber squeegee is used to apply a very thin coat of sealer (a brush may be used to apply a thin coat of the sealer to corners and other hard to reach areas). The squeegee forces the sealer into the voids of the deck covering. Do not leave drops or ridges of the sealer on the surface. Curing is to be in accordance with manufacturer's instructions, but typically the first coat of sealer is allowed to cure a minimum of 2 to 4 hours before application of the second sealer coat. The second sealer coat is applied using the squeegee as in application of the first sealer coat. Allow sealer to cure for the amount of time recommended by the manufacturer. Keep traffic off deck until sealer is cured. The sealing process is complete when the deck has a uniform appearance; i.e., when the surface film is continuous and free of blotchy areas.

b. For available water-based terrazzo sealers conforming to MIL-S-24522, seeTable 634-3-1.

c. Terrazzo sealer spreading rate is about 800 to 1000 square feet per gallon. It may be applied by brush, mop, or as recommended by the manufacturer.

d. Proper attention to periodic resealing will preserve the desirable qualities of the terrazzo deck, facilitate cleaning, and reduce the need for extensive repairs.

e. Failure to seal the terrazzo properly will reduce the effective service life of the material, because water will eventually penetrate the terrazzo, resulting in loss of adhesion, blistering, and cracking, and, eventually, corrosion of the steel substrate.

634-3.10.2.6 Maintenance. Cleaning maintenance shall consist of washing with hot water and detergent prior to repair. See paragraphs 634-6.2 and 634-6.3, for detailed information on terrazzo cleaning materials and techniques.

634-3.10.2.7 Resealing. Existing terrazzo decks are usually resealed by applying one thin coat of the water-based acrylic sealer, MIL-S-24522, using a clean mop or rubber squeegee.

1. Apply the sealer after the deck has been cleaned with free-rinsing detergent (NSN 7930-00-249-836), rinsed, and dried. When ressealing do not leave drops or ridges of sealer on the surface. Allow sealer to cure for the amount of time recommended by the manufacturer. Keep traffic off deck until sealer is cured. If the deck color has become dull and grimy, it can usually be restored by sanding with number 0 steel wool or number 60 sandpaper. The deck shall then be vacuumed, detergent cleaned, rinsed, and dried before applying two or more thin coats of the clear sealer. Allow approximately 2 hours between coats.
2. The need for resealing will vary directly with the amount of traffic and environmental conditions to which a deck is exposed. It is recommended that the deck be resealed at least once every 6 months. High traffic areas may require more frequent resealing; for example, the galley and head are areas subject to greater abuse from high traffic and continuous wetting and cleaning. Therefore, galleys and heads would normally be resealed every 2 to 4 months. The effect of having too little sealer on the deck may be observed as a darkening or dulling of the color because of embedded dirt and grime. If this is the case, light mechanical abrasion with sandpaper or steel wool will be required to rejuvenate the surface.

634-3.10.2.8 Repairs. Even small cracks in the terrazzo should be repaired to prevent water penetration and corrosion of the steel substrate.

1. In those areas where a crack penetrates to the steel deck, the crack may have widened so that the steel can be cleaned and roughened by mechanical means (such as wire brushing). The crack can then be patched with grouting or other nonshrinking material and the surface ground smooth and resealed.
2. In those areas where cracking is superficial or slight, the terrazzo may be sanded or reground and resealed.

634-3.10.3 RESIN-TYPE TERRAZZO. Resin-type terrazzo systems, MIL-D-3134 type 1 class 2, are composed of a thermosetting resin (an epoxy, polyurethane, or polyester), a hardener, and marble aggregate. The marble aggregate may be incorporated in the resin or furnished separately. When mixed and applied according to manufacturer's instructions, the end product is a tough, decorative, durable, impermeable, and chemical-resistant deck covering.

634-3.10.3.1 Application. Clean, solvent wash, and prime the metal surface according to paragraph 634-3.10.2.2. If necessary to slope the deck toward drains or to correct deck plate irregularities, apply underlay MIL-D-3135 type 1, class 2 according to manufacturer's instructions. Apply resin-type terrazzo according to manufacturer's instructions (see paragraph 634-3.10.2.3) These systems shall be applied directly over primed steel or aluminum decks, or approved underlayment only. Multiple layers of resin based terrazzo systems shall not be installed. The thickness of the terrazzo material shall not exceed 1/2 inch and shall be measured before curing. Resin-type terrazzo also requires grinding and sanding or polishing to expose the marble aggregate and to produce a surface which is smooth and aesthetic. No standards have been developed to quantitatively describe the surface finish.

634-3.10.3.2 Sealing.

1. For new installations, follow instructions in paragraph 634-3.10.2.5 with the following exception when applying an epoxy sealer, after application of the second coat, ′back-roll' surface with a short nap roller to remove

ridges or marks left by the squeegee and impart an ″ORANGE PEEL″ surface. Allow sealer to cure for the amount of time recommended by the manufacturer. Keep traffic off deck until sealer is cured.

2. Application of sealer to existing resin-type terrazzo manufacturer's directions and the safety precautions of paragraph 634-1.4.3.
   a. Epoxy sealers are supplied with an epoxy resin-type terrazzo while polyurethane sealers are supplied with a polyurethane resin-type terrazzo.
   b. Only intermediate and depot level maintenance activities are authorized to use an epoxy sealer for refinishing existing deck (terrazzo) surfaces.

634-3.10.3.3 Maintenance. Cleaning shall consist of washing with hot water and detergent. See paragraph 634-6.3.1 for detailed information on cleaning terrazzo.

634-3.10.3.4 Resealing. The surface should be resealed when it begins to show signs of wear or begins to dull or lose its uniform appearance. Resealing shall be done in accordance with manufacturer's instructions (see paragraph 634-3.10.2.7).

634-3.10.4 COSMETIC POLYMERIC DECK COVERING SYSTEMS. Cosmetic polymeric deck covering systems shall conform to MIL-D-24613. These systems consist of a resin binder (epoxy, polyester, or polyurethane) and a matrix which may consist of marble or quartz chips, or a color flake type system. When mixed and applied according to manufacturer's instructions, the end product is a tough, durable, decorative and chemical resistant deck covering. Cosmetic polymeric deck covering MIL-D-24613, type I, class 3 or type III may be used in place of MIL-D-3134, type I, class 2, in spaces where paragraph 634-3.10.2.7 specifies terrazzo. **When applying, repairing, or resealing MIL-D-24613, type II, the safety precautions in paragraph 634-1.4.3 shall be strictly followed** .

634-3.10.4.1 Application. Clean, solvent wash and prime the metal surface according to paragraph 634-3.10.2.2. If necessary to slope the deck toward drains, or to correct deck plate irregularities, apply underlay MIL-D-3135 type 1, class 2 according to manufacturer's instructions. Apply cosmetic polymeric deck covering systems over primed metal or underlay according to manufacturer's instructions. These systems shall be applied directly over steel or aluminum decks, prepared according to manufacturer's instructions, or over approved underlayment only. Multiple layers of the system or components of the system, except for sealer coats, are prohibited. The thickness of type I and type III materials shall not exceed 1/2 inch, and 1/4 inch for type II (polyurethane) materials. The thickness shall be measured before the materials have cured. When installing MIL-D-24613 materials, all components of the system shall be from the same manufacturer.

634-3.10.4.2 Sealing. Cosmetic polymeric deck covering MIL-D-24613, type I and type II, shall be sealed in accordance with manufacturer's instructions. The sealer shall be from the same manufacturer as the other components of the system.

634-3.10.4.3 Maintenance. Cleaning shall consist of washing with hot water and detergent. See paragraph 634-6.3.1 for detailed information.

634-3.10.4.4 Resealing. The surface should be resealed when it begins to show signs of wear, or begins to dull or lose its uniform appearance. The sealer used for resealing shall be from the same manufacturer as the existing system. Resealing shall be done in accordance with manufacturer's instructions.

634-3.11 STANDING MAT

634-3.11.1 Standing mats should conform to the following specifications:

a. Barber and dental chair. FED SPEC ZZ-M-42, black with green and white texture, 18 pounds.

b. Watch stations. MIL-M-910, black, 30 inches by 36 inches (NSN 9Q 7220-00-292-2096).

634-3.12 ELECTRIC SHOCK PREVENTION

634-3.12.1 GENERAL. An insulating deck covering is necessary to prevent electric shock to persons who may touch bare, energized, ungrounded circuits while standing on bare decks. Although dry wood decks are not conductive they constitute an electrical hazard when wet. Both metal (steel and aluminum) and wood decks require an insulating deck covering. Insulating deck coverings are not required over non-metallic honeycomb false deck panels. After installation, the decking should be checked at least once annually to ensure that the surface is not cracked, punctured, or perforated and that no metal or conductive particles have become imbedded. If the decking is not cemented, check several areas with calipers. Discard and replace if any thickness is less than 1/32 inch (.03 inch). However, if the decking is cemented, the thickness should be determined at least annually using a suitable thickness gauge such as one of the magnetic types cited in **NSTM Chapter 631** .

634-3.12.2 MATERIALS. There are two types of deck covering for preventing hazardous electrical shock by insulating personnel from direct ground through the metal deck. The deck may be covered with an approved deck material specified for the space such as deck tile and an electrical insulating portable or runner-type deck matting in way of the electrical hazard areas; or an electrical grade sheet may be installed by cementing the sheet over the entire deck. Principal differences are that the sheet material is generally more attractive and is easier to maintain. If the compartment is not a designated electrical space (see Table 634-2-1) but contains electrical equipment such as switchboards, panels or electrical insulated work benches and is not protected with an approved electrical sheet deck covering; type I, install an appropriate length of mat, type II or III, on the the deck adjacent to the electrical equipment, insulated work benches, and operating and servicing areas of electrical panels, and switchboards. The mat should be installed over the minimum area necessary to prevent electrical shock hazards; but not less than 3-feet wide. Exposed corners shall be rounded off. Cementing the mat to the deck is optional, except that the material shall be installed without cement in the vicinity of removable deck plates. Cementing procedures herein shall be followed. If a compartment is designated an electrical/electronic space (see Table 634-2-1), the electrical grade deck covering shall cover the entire space. Although sheet material, Type I, is recommended for these spaces, matting material, Types II or III, may be used, and should be installed by cementing directly to the deck.

a. **Electrical Grade (Dielectric) Sheet, MIL-M-15562, type I** . Approved marbleized patterns of electric grade sheet are as follows:
   1. NSN 9Q 7200-01-025-1695, floor covering, marbleized, color - green.
   2. NSN 9Q 7220-01-024-9039, floor covering, marbleized, color - beige.
   3. NSN 9Q 7220-01-024-9040, floor covering, marbleized, color - blue.
   4. NSN 9Q 7220-01-024-9041, floor covering, marbleized, color - terra cotta.

b. **Portable Mat, MIL-M-15562, type II, smooth surface** . Stock materials which may be used as electrical insulating deck matting on surface ships are:
   1. NSN 9Q 7220-00-267-4630, solid blue or marbleized blue

2. NSN 9Q 7220-00-913-8751, solid green or marbleized green
3. NSN 9Q 7220-00-255-0765, black Type II matting is not recommended for use on submarines.

c. **Portable Mat, MIL-M-15562, type III, Diamond Tread pattern** . Diamond tread is available in green or gray as follows:

1. NSN 9Q 7220-01-056-1944, green, 0.188 inches by 36 inches by 25 yards.
2. NSN 9Q 7220-01-057-1897, gray, 0.188 inches by 36 inches by 25 yards.

634-3.12.2.1 Sheet. The sheet may be installed over one layer of a resilient-type deck system (vinyl, vinyl asbestos, rubber tiles, or sheet), provided that the existing covering adheres tightly to the deck and that required deck repairs have been made. The deck surface must first be cleaned with a floor stripper and detergents to remove all traces of oil, grease, soil, and old floor finishes. Prior to installing the deck covering over bare metal, prime the deck with 2- to 4-mils dry film thickness of formula 150, MIL-P-24441 or other approved equivalent. Allow the primer to dry and cure a minimum of 16 hours; then cement the electrical sheet to the deck using an approved adhesive only. Type I Electrical grade sheet shall be used in submarines in spaces designated in Table 634-2-1. The sheet must be installed in accordance with either paragraph 634-3.6.3.4 or the manufacturer's instructions, provided the manufacturer recommended adhesive contains no toxic substances and has a **FLASH POINT (TOC)** no lower than 38°C (100°F). Seams within 3 feet of electrical hazards should be treated in accordance with paragraph 634-3.12.3.

634-3.12.2.2 Mat. Deck matting is designed for interior use and is to be installed over existing deck covering or over a metal deck previously coated with 2- to 4- mils of a primer such as formula 150, MIL-P-24441, or other NAVSEA-approved primer. Priming removable aluminum false deck plates is not required. Cementing the mat to the deck is not required for personnel safety, but if the mat is not cemented, stencil an outline of the mat on the deck. Inside the outline, stencil, **ELECTRIC GRADE MAT REQUIRED WITHIN MARKED LINES** , using 3/4-inch or larger letters. As an alternative to the painted stencil, a preprinted self-adhesive plastic film bulls eye may be used. The self-adhesive plastic film shall be 3M Company Y-7902 or equal. If removable (not cemented) electrical grade matting is installed throughout a space, painting an outline of the area is not required, however, the caution stated above shall be stenciled on the deck such that if any section of matting is removed, the words shall be clearly visible. All existing installations of previous electrical grade matting material should be retained. Seams within 3 feet of an electrical hazard should be treated as described in paragraph 634-3.12.3. Other seams may be treated in the same manner to reduce maintenance and enhance appearance.

634-3.12.3 SEAMS. Electrical insulating deck covering should be installed so that there are no seams within 3 feet of an electrical hazard. Where this is not possible, thermoplastic deck coverings, such as vinyl sheet manufactured by Lonseal, Inc., should be fused chemically, or heat welded or heat fused with a special hot air gun. Refer to manufacturer's installation and specification manual. With rubber deck coverings fusing with heat is not possible. With these deck covering materials, a 3- or 4-inch wide strip of #51 **Scotchtape** 20-mil thick Polyvinyl Chloride (PVC) tape (manufactured by Minnesota Mining and Manufacturing Company) should be installed beneath the seam to prevent a direct path to ground via the seam. As an alternative to the PVC tape, a 1-foot wide strip of the electrical grade deck covering may be used under seams. The vinyl tape or the matting strip may be used under either rubber or vinyl type coverings (in lieu of heat welding vinyl).

634-3.12.4 CLEANING AND MAINTENANCE. It is recommended that a floor finish be applied immediately after type I sheet has been installed, and that it be renewed as required in order to reduce soiling and improve appearance. On surface ships, the floor finishes specified in Section 6 are nonconductive and do not compromise personnel safety. Refer to Section 6 for cleaning and maintenance information for resilient deck coverings. On

submarines, only **PRO-TEX-8908** floor finish (NSN H 7930-01-183-9562) manufactured by Intex Products, Incorporated, Greenville, SC 29606, is considered safe for use.

634-3.12.5 REQUIRED LOCATIONS. Typical areas for the application of electrical insulating deck coverings are:

a. Operating areas in the front and rear of propulsion-control cubicles, power and lighting switchboards, interior-communication switchboards, test switchboards, fire-control switchboards, and shipboard announcing system amplifiers and control panels.

b. The area around electronic equipment with which personnel who are servicing or tuning energized equipment may come in contact.

c. The area around workbenches in electrical and electronic shops where electrical or electronic equipments are tested or repaired.

d. The area around access plates and portable plates. NAVSEA dwg DLG 15-606-4621550 or 805-2104467 should be used a guide for the installation of dielectric matting. A straight cut seam may be used if it is not practical to make a 45-degree angle bevel cut.

e. It is recommended that electrical grade sheet material MIL-M-15562, Type I be used exclusively for all submarine electrical/electronic area decking installations.

634-3.12.6 DECK PREPARATION. Prior to installation of electrical grade matting, the deck surface must be properly prepared.

1. **Over metal (steel or aluminum)** . Remove old paint, rust, grease, and other contaminants from the deck. Coat the deck with 2- to 4-mils dry-film thickness of epoxy primer formula 150, MIL-P-24441 or other NAVSEA-approved primer. See **NSTM Chapter 631** for application instructions. Priming interior removable aluminum false deck plates is not required. If the deck can not be coated soon after it is prepared, it must be wiped down with a degreasing type solvent such as NSN 6850-00-274-5421 (5 gallon) or 6850-00-110-4498 (1 pint) before primer application. The matting should be placed or cemented over the primed deck.

2. **Over deck tile** . If the matting is to be cemented, remove all traces of wax and dirt from the deck tiles where the matting is to be located. If a water-base or latex-type adhesive such as MIL-A-21016 is used, it is recommended that the top surface of deck tiles be lightly abraded with coarse steel wool or fine sandpaper to improve adhesion.

634-3.12.7 INSTALLATION. Install electrical grade matting in accordance with manufacturer's recommendations.

634-3.12.8 WEIGHT. Electric grade matting weights are:

a. The weight of the matting and cement is approximately 1.5 lbs/ft^2 for 3/16-inch thickness. The weight of 1/4-inch matting is about 2 lbs/ft^2 .

b. The weight of the vinyl sheet, 1/8-inch thick, is approximately 1.0 lb/ft^2 .

634-3.13 ACID-RESISTANT RUBBER SHEET

634-3.13.1 GENERAL. The entire deck of a submarine battery compartment, including drainage sumps, side walls to a height of about 9 inches above the bottom of the outboard cells, and end walls to a height of about 2-1/2 feet should be lined with a double 1/16-inch thickness of rubber sheeting, MIL-S-2912, type II. The entire lining should be cemented to the compartment interior to form a tight, leakproof covering. The seams should be staggered. Decks of acid storerooms and battery-charging storerooms on surface ships should be covered including up to 4 inches on bulkheads and stiffeners.

a. This method of lining battery compartments utilizes vulcanized neoprene sheets, which should be obtained in rolls 36 inches wide and 1/16-inch thick. The application of two sheets, with various cements, results in a firmly bonded layer of 1/8-inch thickness.

b. No heat or pressure is required as the cements used are designed to vulcanize at room temperature. Maximum strength, however, is not obtained for several days, and batteries should not be placed in the compartment for at least 2 days after all work is finished.

c. The components of this system consist of a primer, bonding cement, putty, and vulcanized neoprene sheets which have been buffed on both sides. It is necessary to add accelerator to the bonding cement and to the putty prior to use.

634-3.13.2 POLYURETHANE DECK COVERING SYSTEM. As an alternative, a polyurethane deck covering system may be used. The polyurethane deck covering system shall be from Products Research Chemical Corporation or equal, and shall consist of the following components: a primer (PR 420) applied at 2 mils dry film thickness, a polyurethane base material (PP 1539U) applied at 1/8-inch thickness, and a surface material, either two coats of red color topping (PR 1120) applied at 3-5 mils dry film thickness per coat, or a dark gray non-skid coating (PR 1139R) applied at 30 mils. The area under the battery rack and the bulkhead area shall be coated with the red color topping. All other deck areas shall be coated with the nonskid coating.

634-3.13.3 INSTALLATION. Guidance for installation of neoprene (synthetic rubber) sheeting is given in the following subparagraphs. Consult the manufacturer for installation instructions.

634-3.13.3.1 Material. Required materials consist of:

a. Primer, according to manufacturer’s instructions

b. Bonding cement, according to manufacturer’s instructions

c. Accelerator for bonding cement, included with KZ-8030-291-0966

d. Vulcanized neoprene sheets, 1/16-inch thick and 36 inches wide, buffed on both sides (NSN 9Q-5330-291-5536)

e. Putty (NSN 9Q-8030-285-1568)

f. Accelerator for putty, included with KZ-8030-285-1568

g. Toluene

h. Denatured alcohol (NSN 9G-6810-00-222-2373).

634-3.13.3.2 Safety Precautions. The following safety precautions shall be observed after abrasive blasting and during the lining operation:

1. The battery compartment and the platform above it shall be closed off to all personnel except those from the rubber shop.
2. Both bulkhead doors shall be closed, and a fire watch shall be established and maintained during the lining operation.
3. Fire extinguishers (class B) shall be placed near the workmen laying the rubber.
4. No smoking shall be permitted in the battery compartment or in the areas near it.
5. No welding or smoking shall be permitted within a radius of 25 feet around the hatch leading to the battery compartment.
6. No welding shall be performed on either battery-space bulkhead.
7. These precautions shall be emphasized by appropriate signs and enforced by the fire watch.
8. Adequate forced-draft ventilation, preferably suction, shall be provided, with a minimum of one air change per minute.

634-3.13.3.3 Preparation of Surfaces. Surfaces to be coated with neoprene should be treated as follows:

1. Wiped free of any oil, grease, or water. The battery compartment should be swept clean.
2. The surfaces to be covered should be grit or sandblasted. The grit or sand should be swept up and removed. The blasted steel surfaces should be inspected by a rubber shop supervisor before application of the first coat of primer.
3. For a period of at least 8 hours prior to abrasive or grit blasting, the temperature of the battery compartment should be not lower than 75°F. This temperature should also be maintained during the blasting, cementing, and lining operations.

634-3.13.3.4 Application. The neoprene lining should be applied in accordance with the following procedure:

1. Immediately after abrasive or grit blasting, the blasted surface should be brushed clean and two coats of primer applied.
2. Each coat of primer should be allowed to dry for not less than 1 hour and should be thoroughly dry before proceeding with subsequent operations.
3. All welded seams, corners, and any sharp irregularities in the compartment surface should be brushed with accelerated bonding cement. After the bonding cement has dried, accelerated putty (see subparagraphs 4a and 4b) should be used to fair or taper off welds and other projections and fillet corners so that the lining to be applied subsequently will rest on a smooth base. This is shown on Figure 634-3-1. The putty should be allowed to dry for not less than 8 hours, and preferably overnight, before additional operations are performed.
4. The neoprene sheet should be cut to the proper size to conform to the patterns shown on Figure 634-3-2 and Figure 634-3-3 and should then be skived on each edge. Two coats of accelerated bonding cement should be applied to the primed metal and to one side of the neoprene sheet at about the same time in accordance with the following instructions:
   a. The bonding cement is shipped unaccelerated, and is ready for use only after accelerator has been added.

One gallon of bonding cement should be accelerated by the addition of 8 fluid oz. of accelerator. If necessary, thin with solvent (toluene) to obtain brushing consistency. Pot life will be about 8 hours.

b. Neoprene putty is shipped unaccelerated, and is ready for use only after accelerator has been added. The following proportions should be used: 1 pound of putty plus 2 oz. of accelerator. Mixing should be accomplished on a smooth metal or glass surface using a stiff spatula or putty knife. The putty should be mixed thoroughly until no yellow accelerator is visible. When mixed, scrape up into a ball, and totally immerse in container of denatured alcohol. Keeping the hands or tools wet with alcohol will allow the putty to be handled without sticking. Pot life will be about 3 hours.

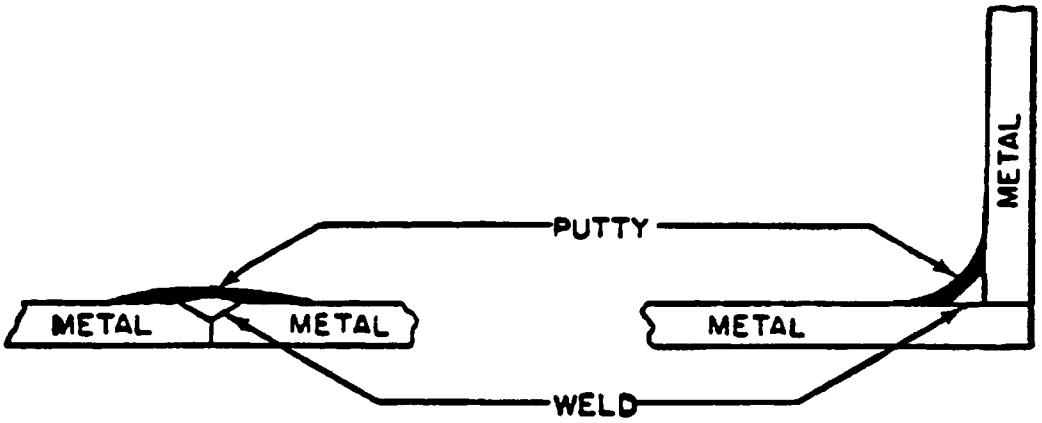


Figure 634-3-1. Application of Putty to Weld Lines and Corners.

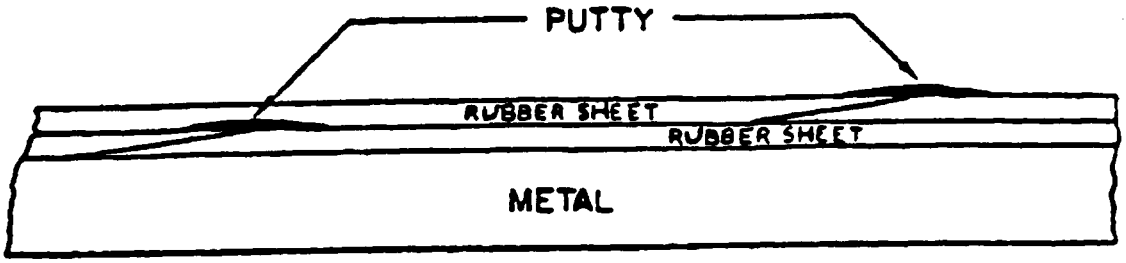


Figure 634-3-2. Finished Overlap on Flat Surfaces.

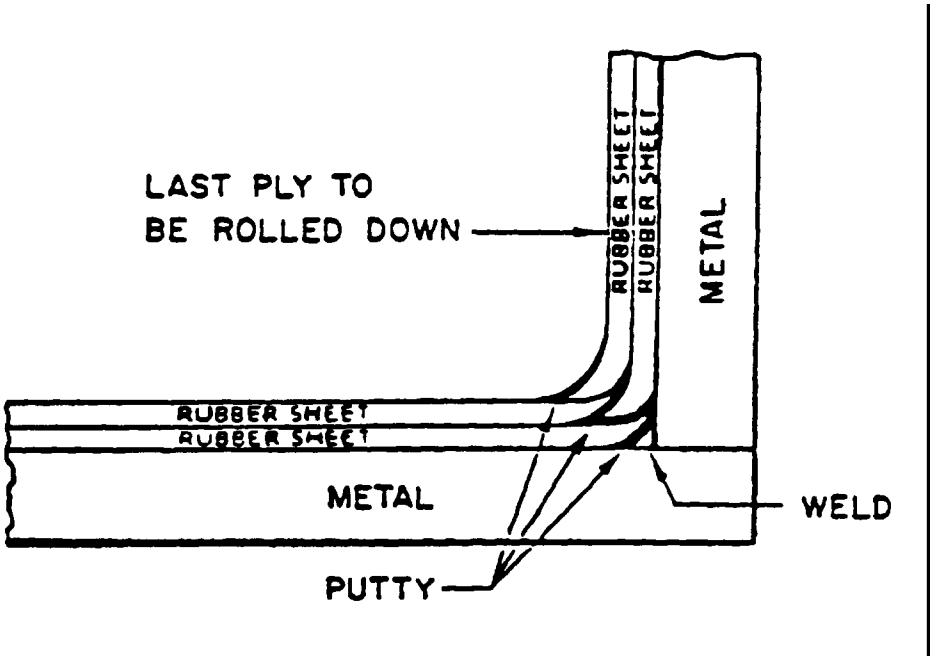


Figure 634-3-3. Finished Overlap in Corners.

c. The surface of the vulcanized sheet stock should be cleaned by scrubbing with a lint-free rag wet with solvent.

d. Two coats of accelerated bonding cement shall be applied to the primed surfaces of the metal and to the scrubbed side of the vulcanized sheet. The first coat may be allowed to dry from 30 minutes to 16 hours. The second coat should be applied at timed intervals, so that the drying time before rolling down the sheet is not less than 15 minutes, nor more than 2 hours. Solvent or air blisters on the surface of any coat of bonding cement should be removed by spraying with a fine mist of solvent. Any type of spray gun may be used.

5. Operators should cover shoes with clean canvas or lint-free cloth when it is necessary to walk on any primed or cemented surfaces. In most cases it will be advantageous to roll up the prepared and cemented sheet stock in lint-free linear cloth. The stock shall be positioned and rolled down as the linear is removed.

6. After each sheet is applied, its skived edge and approximately 1 inch of sheet should be cleaned by scrubbing with a lint-free rag wet with solvent, and then cemented with one coat of accelerated bonding cement, in order to have a cemented surface for the overlap of the next sheet. The cemented area should be wider than the finished overlap.

7. After the first layer has been entirely applied, cement and putty should be applied to all seams with the puttied strip not less than 1-1/2 inches wide, and centered on the seam. After the putty has dried for not less than 8 hours, and preferably overnight, the compartment should be tested as described in paragraph 634-3.13.3.4. Any leaks should be marked with chalk (do not use wax crayon or silver pencil). The marked areas should then be cemented with accelerated bonding cement and puttied with accelerated putty. After the putty has dried for not less than 8 hours (and preferably overnight), two coats of bonding cement should be applied over the first layer and to the underside of the sheets for the second layer.

8. In all cases at least two layers of neoprene sheet should be used, and the skived edges should overlap a minimum of 1/2 inch. The seams in the second layer should be staggered so that they do not cross or coincide with those in the first layer, as shown in Figure 634-3-2.

9. All sheets should be thoroughly rolled down. Trapped air, as evidenced by blisters, should be allowed to

escape by puncturing with a sharp instrument such as an awl. These punctures should be confined to one layer of the neoprene sheet. Puncturing the lining should be done only when absolutely necessary. Any punctured spots should be marked with chalk, and cement later with accelerated bonding cement. Allow cement coat to dry, apply a thin layer of accelerated putty, and allow to dry for not less than 8 hours, and preferably overnight. Clean off chalk by scrubbing surface with lint-free rag wet with solvent.

10. When seams are necessary at the intersection of vertical components of the compartment, they should be so constructed that the horizontal or base sheet can be laid first, and the vertical sheet should overlap the edges of this first sheet as in shingling. This method is shown in Figure 634-3-3.

11. When the compartment is finished, all seams, corners, and edges should be brushed with accelerated bonding cement and allowed to dry 30 minutes. Accelerated putty should be liberally applied, extending a minimum of 3/4 inch on each side of all seams and over the top edge as shown in Figure 634-3-4. Keeping the hands or tools moistened with denatured alcohol will allow the putty to be handled without sticking.

634-3.13.4 TEST OF LINING INTEGRITY. The compartment lining should be tested by exploring the surface with a high frequency, high-voltage tester using the T-electrode shown in Figure 634-3-5. Any leaks should be repaired with cement and putty as described above.

634-3.14 STATIC CONDUCTIVE DECKING

634-3.14.1 **Bureau Oof Medicine and Surgery Instructions (BUMEDINST) 5100.5A** prohibits the use of flammable and explosive anesthetics in shipboard medical spaces. In view of foregoing the use of static conductive decking materials in medical spaces is no longer required. However, static conductive decking in medical spaces should be retained as long as the material is in satisfactory condition. Application of floor finishes or waxes may be used over conductive decking for maintenance. When the conductive decking requires replacement, replace with an acceptable material listed in Table 634-2-1.

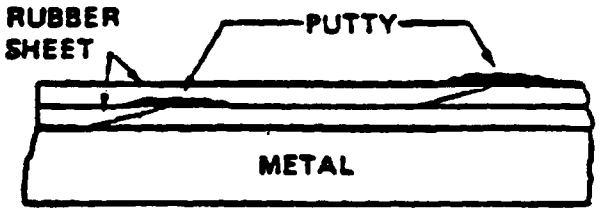


Figure 634-3-4. Method of Finishing Top Edge.

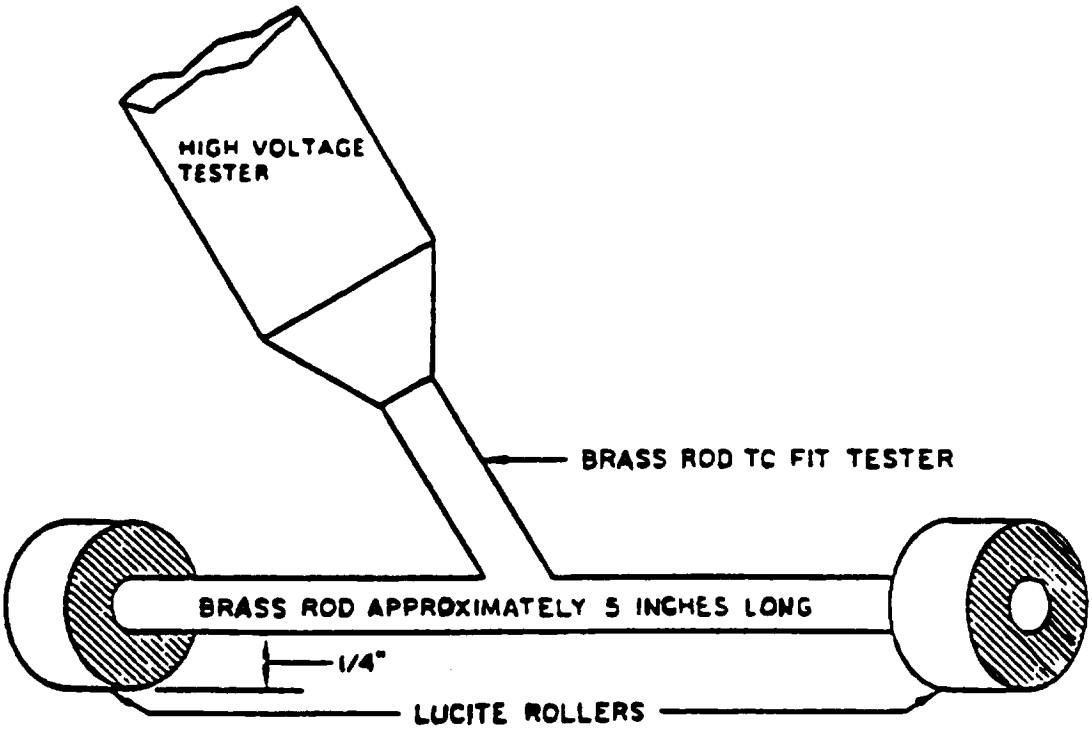


Figure 634-3-5. Lining Integrity Test Jig

634-3.15 LATEX CONCRETE

634-3.15.1 GENERAL. Latex concrete shall conform to MIL-D-21631. The material is nonsparking, fire retardant, and nontoxic, and is designed for installation between aluminum channels in cargo ammunition holds. Although it may be used where steel channels are installed, it is usually more practical from a cost and weight standpoint to install ammunition magnesite in lieu of latex concrete. At 2-inch thickness, latex concrete weighs 24.5 lbs/sq ft versus 20 lbs/sq ft, for ammunition magnesite. All latex must be stored in a heated place to keep from freezing. Spaces to receive deck covering should be maintained above 50°F.

1. Metal decks are to be cleaned free of all grease, oil, loose or old paint not specifically applied as a primer coat, loose rust scale, or other extraneous matter. Solvent wash with 1.1.1 trichloroethane (methyl chloroform) or other approved equivalent.

2. Prime the deck and sides of the channels with Formula 150 in accordance with **NSTM Chapter 631** . Allow to dry thoroughly.

3. After the paint has dried throughout, mask the channel tops with duct or masking tape to prevent concrete from getting on the channel top.

4. Wet the deck and channel sides with a mix of latex and mortar mix made up of a mixture of dolomite, portland cement binder and liquid latex.

5. Following the manufacturer’s instructions for mixing the latex concrete, mix enough concrete to fill the area between the channels. Trowel in enough concrete to fill the area. Ensure that the concrete mix is not too runny.

If the concrete is too runny, it will run under the channels and dry, preventing the use of the tie-down holes in that area. Thicken concrete so that it will not slump or run under the channels.

6. Using a straight edge, screed the surface of the concrete to ensure it is level with the top of the deck channels and has no trapped air in it. Screeding is the process of leveling an installation of concrete. To screed a concrete surface the concrete must still be very workable. Use a straight edge straddled over the edges of the deck tie-down channels, with the side of the straight edge resting on the deck channels on both sides of the installation. Starting in the middle of the installation, slide the straight edge back and forth in three to four inch strokes, perpendicular to the channels, while at the same time moving the straight edge in a direction parallel to the channels. Ensure that during this process the straight edge is always in contact with the concrete. If there is a space between the straight edge and the concrete, additional concrete may need to be added to bring the top concrete surface level with the channel tops.

7. Completely cover the installation with wet burlap, ensuring that there are no creases in the burlap which can cause indentations to the concrete surface. Place polyethylene plastic sheeting over the burlap. Leave the concrete covered for a minimum of 24 hours, then remove both the plastic and burlap.

634-3.15.2 REPAIR. Minor straight line cracks and chipped areas can be repaired by applying a grout made up of portland cement and liquid latex and troweling over the surface to fill the small chipped areas and small fissures. Ensure that the surface is free of all oil, dust, moisture and other contaminants. The concrete will require replacement if either of the following conditions are present: (a) the damaged area consists of spalled cracks or if the cracks are ′spider-webbed’, meaning that there is not just one crack in the area, but several intersecting cracks that have a spider-web like appearance, or (b) the concrete in the area of the spider-webbed and straight line cracks has become loose from the deck and deck channels and is in danger of coming out in chunks creating a hole. Remove and replace the concrete as follows:

1. Locate the area requiring replacement and draw a line on each side of the cracked area to be excavated. These lines shall be perpendicular to the deck channels. The lines shall be a minimum of one inch from the farthest cracks in the area to be excavated.

2. Holding a 1/4-inch chisel at a slight angle from vertical with the point angled towards the center of the excavation area, start chiseling with a sledge hammer on the lines drawn in the previous step. Chisel into the concrete to a depth of about 1/2-inch and spaced about one inch apart.

3. Using the chisel and sledge hammer, start chiseling in the area of the cracks themselves to get down to the steel deck. Remove the pieces of concrete from the area as they come loose. Caution: Do not scar the deck with the chisel.

4. Remove all concrete within the area that was lined off. Do not worry about getting perfectly straight edges on the concrete remaining in place as roughness will help the new concrete in bonding to the old. However, the edges should be as near vertical as possible.

5. Once the old concrete and dust are removed from the area, inspect the edge of the old concrete left in place on each side and ensure that it is still tightly bonded to the deck. If it is not still bonded, remove additional concrete until a bonded area is reached.

6. Using a wire wheel, sander, or needle gun, thoroughly clean the exposed steel deck areas and channel sides taking care not to damage any coatings on the channel tops. Remove dust from the excavated area and wipe down with degreasing solvent.

7. Prime and reapply latex concrete according to paragraph 634-3.15.1.

634-3.16 AMMUNITION MAGNESITE

634-3.16.1 GENERAL. Ammunition magnesite conforming to MIL-D-18873 is a nonsparking, fire retardant, smooth surface product for use between the dunnage system of steel deck channels in cargo weapon stowage spaces. It weighs approximately 10 lbs./ft.^{2} at inch thickness. Contact with aluminum or aluminum alloys must be avoided to eliminate corrosion of these alloys. When aluminum or aluminum alloys are used, or will be in contact with the decking, install latex concrete (see paragraph 634-3.15.1) in place of magnesite.

634-3.16.2 APPLICATION. Clean the metal deck free of all oil, grease, rust, or other extraneous material. For thicknesses over 1 inch, weld firmly into place steel deck clips staggered between the channels on 9-inch to 12-inch centers. For thicknesses less than 1 inch, weld 3-inch by 8-inch by 13-gauge metal lath, welds to be spaced 9 inches in one direction and 8 inches in the other. See Figure 634-3-6.

1. After the clips or wire are firmly in place, apply two coats of anticorrosive compound, MIL-C-15203, or formula 150, MIL-P-24441 or other NAVSEA-approved primer.

2. After the metal deck has been prepared, the deck covering is installed in accordance with the manufacturer's recommendations, generally by preparing a mortar mix of the magnesite formulation and a properly gauged magnesium chloride solution. The mortar mix is to be heavy with a slight slump and troweled in place to the desired thickness. Allow the mortar to set and trowel finish to a smooth surface.

3. Allow the deck covering to dry thoroughly and apply two coats of clear sealer as recommended by the manufacturer.

634-3.16.3 MAINTENANCE. Reseal with sealer recommended by the manufacturer as traffic conditions and resultant surface wear dictates.

634-3.17 MAGNESITE (MAGNESIUM OXYCHLORIDE)

634-3.17.1 GENERAL. Magnesite, MIL-D-16680, is a dull, red-colored, trowelable, heavy-duty deck covering. This material is available in standard Navy stock and should be procured in quantities not exceeding a 6-month supply. In small galleys and pantries where the heavy duty characteristics of magnesite are not required, and weight saving is desirable, i.e., the Captain's galley, flag galley, senior staff officers' pantry, squadron-service pantry, and Warrant Officers' galley, resilient deck tile or sheet may be used. Magnesite weighs 3 lbs/sq ft at 1/4 inch thick versus about 1 lb/sq ft for deck tile. All components of the magnesite shall be from a single manufacturer to avoid a possible difference in color and to assure compatibility.

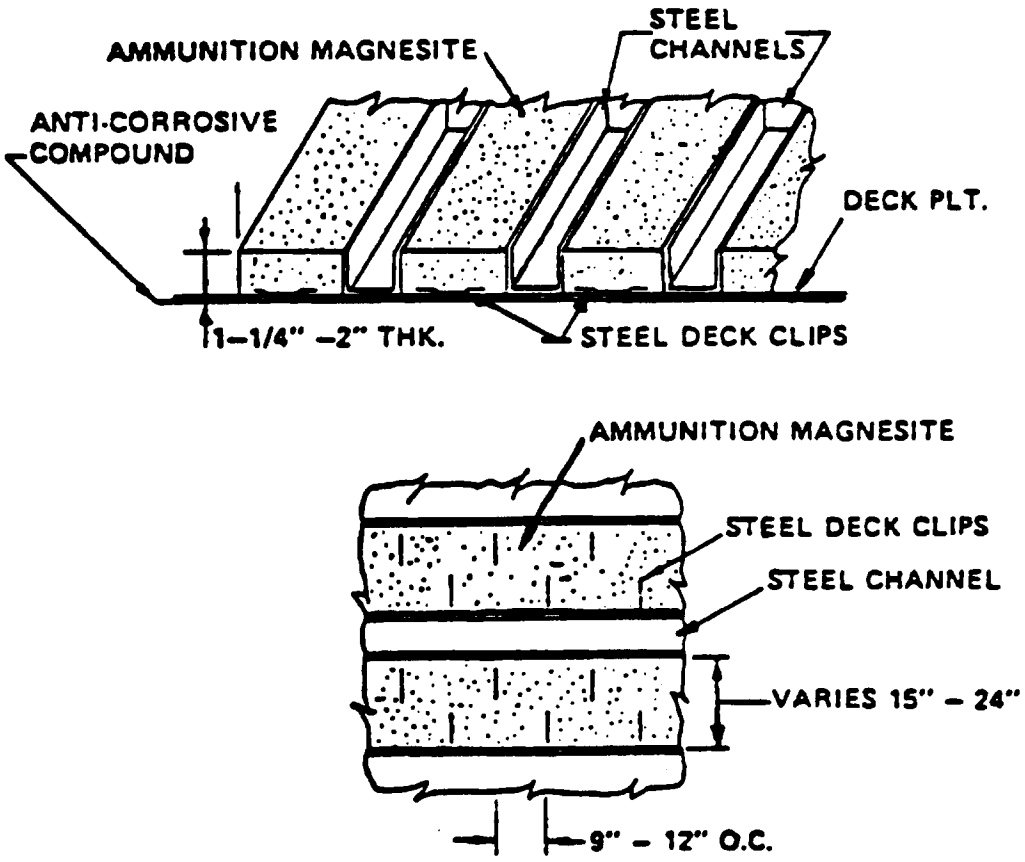


Figure 634-3-6. Installation of Ammunition Magnesite

634-3.17.1.1 Drainage. Magnesite decking is intended to protect the deck and facilitate cleaning. It is not intended to provide drainage to a specific part of the compartment. In inaccessible locations, however, the decking may be sloped to prevent water accumulation.

634-3.17.1.2 Corrosivity to Aluminum. Magnesite is corrosive to aluminum and must be separated from direct contact with aluminum fittings on the deck by use of paint and vinyl tape, rubber sheeting, or latex mastic.

634-3.17.1.3 Coving. For terminating decking at bulkheads, shell, or around stiffeners, provide a coving 3 to 4 inches above the deck covering (except in way of aluminum foundations, bulkheads, or coamings). At arches or drains, the exposed edges shall be protected by a flat bar of corrosion-resistant steel the same height as the covering.

634-3.17.1.4 Surface Discontinuities. Where it is essential to increase the thickness of the covering to provide a fair surface over lapped plating and rivets, the decking itself should be built up to the required thickness.

634-3.17.2 APPLICATION. The following subparagraphs provide guidance for applying magnesite deck covering.

634-3.17.2.1 Material. Materials required to spread approximately 100 square feet at 3/8-inch thickness are listed in Table 634-3-2 with National Stock Numbers and quantities also given.

634-3.17.2.2 Steel Deck Preparation. The deck shall be cleaned to bright steel by blasting, wire brushing, or similar methods, and solvent washed with NSN 6850-00-274-5421 (5 gallon) or 6850-00-110-4498 (1 pint) to remove grease and other residue. An expanded metal lath should be welded to the deck at 18-inch centers. The metal reinforcement should be lifted slightly above the deck to provide a keying action. Next, after ensuring that the deck is thoroughly dry, brush onto the deck and metal lath a surface-welding coat consisting of one part rubber latex and two parts underlay powder by weight; take care to cover all parts of the deck and metal lath. Generally allow drying of this coating to take place overnight, before application of the magnesite. In place of the metal lath, approximately 1/8 inch of latex underlay (see paragraph 634-3.7) may be used as the underlay for magnesite. Allow latex underlay to dry hard before application of magnesite.

634-3.17.2.3 Mixing. Mix in accordance with instructions listed below or specific manufacturer's recommended procedure, if they differ.

Table 634-3-2. MAGNESITE APPLICATION MATERIAL (100 SQUARE FEET)

Material	NSN	Quantities
Surface wetting coat		1 gallon
Magnesium chloride	9G 6810-00-281-4161	90 pounds
Basic cement mix	9G 5610-00-281-2738	270 pounds
Surface dressing	9G 5610-00-281-7810	1/4 gallon
Number 13 gauge expanded galvanized metal lath	9G 5680-00-222-4005	100 square feet
Latex underlay	9G 5610-00-141-7958 and 7959	as required

a. Gaging solution is 22° Baume' magnesium chloride solution which is approximately 45 percent by weight of magnesium chloride and 55 percent by weight of water. It is important to use a Baume' hydrometer for liquids heavier than water to obtain this solution accurately. Into a clean drum, pour about 25 gallons of clear water and stir in the contents of two bags (100 lbs. each) of magnesium chloride. The resulting solution will require approximately 7 additional gallons of water to make up 22 degrees Baume'. A Baume' hydrometer should be used to check the final solution and more flakes or water stirred in until the hydrometer shows the solution to be 22 degrees Baume' solution. If it is necessary to delay the set of the magnesium oxychloride cement, the gaging solution may be chilled with ice. (Make it stronger than 22 degrees Baume' and drop in a cake of ice. When ready to use, remove the ice and adjust to 22 degrees Baume'.)

b. Mix no more than will be used within 1/2 hour. Use a mortar box that is thoroughly cleaned of any cement or lime mortar. Dump the dry cement into the box and work it over with a hoe to get it well dispersed. Then add the gaging solution slowly, working out all lumps. The consistency of the mixture desired by the finisher may be used; however, best results are obtained by using the minimum amount of chloride solution required to produce a workable mix. Normally, this is the point at which the material is sufficiently soft so that it can be leveled off with a wood float or darby. Any chloride excess will reduce the hardness of the finished deck. Except in extremely warm weather, the proper mix, when up-ended in a bucket, should slump to approximately half the bucket height. A ratio of 225 pounds of cement to 10 to 12 gallons of magnesium-chloride solution is suggested. If the magnesium-oxychloride cement stiffens before it can be used, it shall be discarded, never retempered.

634-3.17.2.4 Application of Magnesite. Proceed as follows:

a. **Spreading and leveling** . As the magnesium-oxychloride cement is spread in place, care should be exercised to see that it is worked onto the metal reinforcement or latex underlay to ensure good contact. While it is still soft, it should be leveled off to a full 3/8-inch thickness (never less, even in spots) above the mesh or latex underlay.

b. **Compact and sealing** . As the magnesium-oxychloride cement stiffens, it should be given two or more flat trowelings with a steel trowel to compact it and produce a smooth, dense surface. At the time of final troweling, the trowel is tilted, usually on its edge, and the pressure is increased. The color uniformity and surface texture, as well as the wearing qualities of the decking, are determined to a large extent by these trowelings. The directions for finishing are general. Much depends on the finisher and his experience, skill, and desire to turn out a good job. Results will be satisfactory if the following technique is adhered to:

   1. Make sure the deck is properly prepared.
   2. Thoroughly work the first of the cement onto the lath or underlay.
   3. Get the cement perfectly flat while it is soft enough to use a darby.
   4. Compact the cement well with several hard steel trowelings as it stiffens.
   5. Completely seal the surface closing pits and irregularities.

634-3.17.2.5 Protection and Surface Treatment. After final troweling, the deck should be left uncovered overnight with the spaces closed as well as possible to prevent drafts. The following day it should be gone over lightly with No. 0 steel wool (with care taken not to burr the surface) and given a coat of clear dressing. The steel wool removes slight surface imperfections or light trowel marks, while sealer evens up color and corrects cat faces. For the first 2 or 3 days, the temperature should be kept at no less than 21°C (70°F). After the deck covering has dried for 5 days, the dressing should be applied with a brush, rag, or paint roller and allowed to penetrate. A second or third application may be required in some areas that absorb rapidly (allow 3 hours between coats). Excess sealer should be wiped off the surface within 10 to 15 minutes so that it does not have an opportunity to become gummy. The purpose of the sealer is to provide protection by penetrating and sealing the pores against dirt and moisture. The deck should be allowed to dry overnight before it is open to service.

634-3.17.3 WATER RESISTANCE. The water resistance of magnesium-oxychloride decking does not develop as soon as it hardens, but is the result of a slower chemical reaction which occurs over a 2-week period. During this time it shall be protected against exposure other than slightly damp mopping. If this care is observed, the service performance of the deck will more than pay for this careful treatment.

634-3.17.4 MAINTENANCE. Magnesite should be cleaned with detergent solution as described in paragraph 634-6.3.2. After some time in service, the decking color may fade. Paint should never be used to rehabilitate this deck covering. Although it initially produces a glossy finish of uniform color, paint covers up the color which is an integral part of the deck covering and in a short time begins to wear off in heavy-traffic areas. When this happens, two shades of color will show up in the deck covering. The color can be renewed by going over the surface with fine steel wool, and then treating it with colorless sealer in the same manner as described above for the initial installation.

634-3.17.4.1 When necessary to repair deck covering cracks, first widen the crack in the form of an inverted V (with the wide space at the bottom). Remove dirt and grease. Mix and apply new material as specified above. After allowing to dry overnight, lightly rub with steel wool and apply a sealer as detailed above.

634-3.18 CARPET

634-3.18.1 GENERAL. Unless otherwise specified, shipboard carpet shall be wool, velvet, woven through the back, conforming to FED Spec DDD-C-95, type II, class 1, 2, or 4 and the fire requirements of MIL-STD-1623, or other NAVSEA approved carpeting. Use of carpeting is limited to the following spaces:

a. Flag quarters

b. Commanding Officer's Quarters

c. Other quarters of equivalent rank (such as Troop Commander's Quarters)

d. Executive Officer's Quarters

e. Wardroom lounge

f. Library

g. Chief Petty Officer's Lounge

h. Chapel

i. Ballistic missile control center (POSEIDON SSBN only) - for noise control.

634-3.18.2 INSTALLATION. Install the carpet directly over the metal deck as follows (note that carpet pads are not authorized):

1. Grind down any weld seams which protrude more than 1/16 inch so that seams are no higher than 1/16 inch.
2. Prepare deck surfaces and prime with an anti-corrosive primer, formula 150, MIL-P-24441, or other NAVSEA-approved primer. See **NSTM Chapter 631, Volume 2** , for specific instructions.
3. Fair the deck with underlay, MIL-D-3135, type II on and around rivet heads, plating depressions, weld seams, and similar spots to prevent high spots and deck irregularities from showing through the carpet and promoting premature wear. If desired, Products Research Chemical Corporation **PR-1539U** , installed to a maximum thickness of 1/4–inch, may be used as an underlay in lieu of MIL-D-3135.
4. Ensure underlay is smooth, sanding any high or rough spots, as necessary.
5. Install the carpet by the tackless procedure or by cementing it to the primed deck with a water-based adhesive such as MIL-A-2106 adhesive or one recommended by the carpet manufacturer. Carpets may be installed so as to abut permanently installed fixtures and furniture, but otherwise shall cover the deck completely. A bright CRES or aluminum strip shall be installed where the carpet abuts other deck covering in foot traffic areas.

634-3.18.3 MINIMIZING APPEARANCE OF SOIL. Special attention should be given to choosing the proper carpet color to reduce apparent soiling. Tweeds generally show soil less than solid colors. Medium-depth shades show soil less than lighter shades. Colors such as greys, browns, and greens are particularly good for their soil-hiding properties. Very dark shades show light-colored dust conspicuously and should be avoided near entryways and adjacent to hard floor areas. There is no way to keep carpets in regular use from getting dirty, but the soiling rate can be retarded in many cases. Except on submarines, carpets shall be treated with a soil retardant treatment such as 3M Brand Carpet Protector or equal prior to use. The suitability for use on submarines will be

determined in accordance with atmospheric control requirements. Tracked soil can be greatly reduced by use of walk-off mats located at entrances and where carpet adjoins the deck tile. These walk-off mats may be selected from several types such as:

a. A bound rug made from the same fabric as the carpet.

b. A coir door mat (FED SPEC DDD-M-156).

c. A safety rubber mat (MIL-M-15562).

d. A rubber or plastic link mat (FED SPEC ZZ-M-46).

e. A carpet runner of matching fabric especially for use at main entrances and in areas of very heavy traffic. Where fabrics are subjected to heavy abrasion from caster-wheeled chairs, protective pads or mats are recommended.

634-3.18.4 ROUTINE MAINTENANCE. A routine maintenance program is critically important in maintaining satisfactory carpet appearance. Almost all carpet cleaning consists of common sense practice of these cardinal rules:

a. Frequent (daily to weekly, depending on traffic volume and location) vacuuming or sweeping of all areas.

b. An upright vacuum cleaner of the motor-driven brush and beater type is essential for proper carpet care. A tank-type cleaner can be used for occasional touch-up work but is not recommended as the principal cleaning equipment. The combination of a tank cleaner and a separate motor-driven brush-and-beater floor tool can be used to advantage. The tank cleaner can also be used with a vacuum wand to pick up loose surface dirt and to clean difficult-to-reach areas.

c. Prompt removal of spills and attention to spots and smudges.

d. Light cleaning of heavy-traffic areas with dry powder or foam as needed to prevent over-soiling.

e. Daily vacuuming is often essential to reduce abrasion by sand and grit and to prolong carpet life. In areas of extremely heavy foot traffic, it may sometimes be necessary to vacuum several times per day.

634-3.18.5 SPOT CLEANING. Prompt attention to spills is important. They should be treated when they occur or when first discovered. Early blotting of liquid spills with a soft absorbent paper towel or cloth will reduce the probability of a permanent spot or stain developing. Regardless of the type of spill involved, there are certain basic procedures that should be followed in attempting removal. The following recommendations are suggested for spot removal:

1. Soak up as much of the spill as possible with a towel.

2. Before using any cleaning agent, try a small amount on an inconspicuous corner of the carpet to make sure the cleaner itself will not mark the fabric. For spills known to consist solely of water soluble or wettable materials, a detergent solution is the best cleaning agent. Dry cleaning fluid is usually effective for oily materials, paints, and lacquers. The proper procedure for the removal of a spot or stain of unknown composition is to try dry cleaning solvent first. If this is not successful, a detergent solution should be used. The detergent chosen should dry to a powder that can be easily vacuumed, thus not leaving a sticky residue that is apt to resoil.

3. Apply a small amount of cleaning agent to the spot and remove the loosened material with a clean white towel. Take care not to over wet the area to avoid spreading the contaminant.

4. Always start from the edge of a spot and work towards the center.
5. Rub as little as possible. Rubbing has a tendency to spread the spot and distort the pile.
6. Repeat the above procedures until spot has disappeared and place clean towel or absorbent tissue with weights over the treated area until dry.
7. For chewing gum, wax, and other adhering materials, spray the spot with one of aerosol products designed to solidify the contaminant. Immediately scrape off the brittle contaminant with a plastic spatula. The material can be solidified by freezing, using dry ice or ice cubes in a plastic bag. Spot cleaning with trichloroethane or other cleaning agent may be necessary to remove last traces of the spot. These techniques will remove almost all spots or stains. If the stain is rust or some other material that is not easily removed, spotting kits are available that can be used to remove such specific agents.

634-3.18.6 MAJOR CLEANING. Over a period of time, every carpet will accumulate ground-in soil that cannot be removed by routine sweeping and vacuuming. A more rigorous cleaning method then becomes necessary. The importance of cleaning the carpet promptly when it begins to show soil cannot be overemphasized. Failure to do so will result in rapid deterioration of appearance and materially shorten effective life. After being cleaned, the carpet should not be walked on until completely dry. Major cleaning should usually be done once or twice a year. Actual frequency will depend on the traffic level, degree of preventive maintenance, carpet color, vacuuming efficiency, appearance level sought, and effectiveness of previous shampooings. Excessive shampooing will lead to premature carpet failure. Any of the following cleaning procedures may be used (for heavily soiled carpet, steam cleaning is recommended).

634-3.18.6.1 Rotary Brush Shampoo. Rotary brush shampooing is the oldest and most widely used method of in place carpet cleaning. It utilizes a shampoo machine which drives the detergent solution into the pile with a flat revolving brush. This action breaks the oil film on the fibers and releases trapped dirt particles. Some procedures call for wet vacuuming to remove dirt and water. In other procedures the carpet is allowed to dry, and the powdered detergent and dirt are then vacuumed away. This method can be quite effective when employed by a skilled operator. It has two disadvantages. It requires a relatively long drying time, and may result in some permanent pile or texture distortion of shags and high pile plush carpets.

634-3.18.6.2 Dry Foam. In this method, liquid shampoo is generated into a foam and evenly distributed on the carpet. The foam is worked into the pile with cylindrical brushes. Soil removal is improved by immediately vacuuming the carpet with a wet vacuum pick-up unit (several foam machines have such units built in). Since the amount of moisture used in the method is small, the total drying time is reduced and the carpet can usually be returned to service in a shorter period of time. This method also has some disadvantages:

a. Because mechanical action and flushing action are less vigorous than with the rotary brush, this method usually does not loosen as much imbedded soil.
b. Initial surface brightening is usually less effective than with rotary brush shampoo, especially in very heavily soiled areas, and a repeat cleaning is sometimes necessary.

634-3.18.6.3 Steam Cleaning. The term **steam** cleaning is a misnomer, because it is not steam but a hot detergent solution that is sprayed into the carpet by a controlled, high-pressure jet. Hot water and detergent penetrate deep into the carpet pile, breaking the oil film and loosening soil. The cleaning solution and its suspended dirt are extracted from the carpet almost immediately by means of a vacuum head located just behind the pressure jets.

a. The advantages of steam cleaning are:
   1. Immediate soil removal by a vacuum system which sucks up detergent solution and loosened dirt.
   2. Minimum pile distortion or texture change because no pile brushing is involved. This is particularly advantageous for high pile plushes and shags whose textures can be easily distorted by vigorous brushing action.
   3. Detergent buildup in the carpet pile, which may contribute to resoiling, is minimized.

b. The disadvantages of steam cleaning include:
   1. Somewhat slower cleaning in terms of covering a large area of carpeting in a relatively short period of time.
   2. Higher cost than other methods.

634-3.18.6.4 Dry Powder. In the dry powder method, a solvent-saturated absorbent powder is worked into the carpet pile by hand or by a revolving brush machine. After application, the wet powder is allowed to dry for a period, generally several hours, and then the carpet is vacuumed.

a. Advantages: Minimizes texture and color changes. Prolongs time before wet cleaning becomes necessary.

b. Disadvantages: Not as effective for cleaning badly soiled carpets particularly when dry clay-type soils are deeply imbedded in the pile surface.

634-3.18.7 REPAIR. After being placed into service, carpeting is subject to snags, burns, and fraying which require repair work.

a. **Snags** . During carpet manufacture, extra long yarn ends may sometimes become curled into the pile, and escape inspection. Once in service, an occasional such tuft may rise (or sprout) above the pile surface. This sprout is not a snag and does not mean that the carpet is coming apart; it is necessary simply to clip the protruding end with scissors at the level of the pile surface. A snag may result when an object, such as a shoe with a protruding nail, catches a loop and pulls it up. In this case, too, the high loop should be cut off even with the pile. Never pull on high tufts or loops protruding from carpet surface since this action can cause additional damage.

b. **Cigarette burns** . A burn that chars the carpet surface in a superficial way will clear up nicely with careful clipping of the blackened tuft ends, followed by use of a soapless cleaner (such as carbona) and water sponging. Severely burned spots need replacement. The burned area may be cut out and the damaged section repaired with a patch of the same carpet material, or a professional carpet repair service may be used.

c. **Frayed ends or seams** . Repairing carpets and rugs with frayed edges, whipped outends, worn hems, or worn-out fringe is usually a job for the professionals. However, if repair is attempted, follow these rules: First, trim off the worn or frayed parts. Start where the damage is deepest or most severe. Use large sharp shears, a sharp knife, or a single-edge razor blade, and cut from backing side. Follow one of the crosswise or lengthwise yarns or ridges. If required, a CRES or an aluminum hold-down bar may be installed to prevent further fraying along the edges.

634-3.19 ALUMINUM SAFETY TREAD

634-3.19.1 Aluminum safety tread acceptable for shipboard use shall conform to FED SPEC RR-T-650, grade C, type III, and shall be attached to the deck with countersunk aluminum or CRES screws. Where treads are intended for use on decks that cannot be drilled and tapped, such as tank tops, secure treads to deck with epoxy base adhesive.

634-3.20 FOUNDRY DECKS

634-3.20.1 Hard, heat-resistant, nonburning brick (2 inches by 4 inches by 8 inches) shall be installed with dry silica sand. Both materials shall be installed over the steel deck within a steel coaming (Figure 634-3-7). The brick shall be placed tightly together with the 4- by 8-inch dimension face up. Dry silica sand, 2- to 3-inches thick, shall be placed over the brick, leaving at least 1 inch of free space between the sand and the bottom of the steel grating to prevent mounding between the grate bellows. The steel walking grate shall conform to MIL-G-18014, type A, class B, 2 by 6 feet in size, except where the configuration or space requires a smaller size. Panels shall be supported by angles or bars not to exceed approximately 2 feet in the direction of the crossbars. The perimeter of each grating shall be supported. Loads shall not be carried by any brickwork. Panels and special sections shall be secured to the supporting framework by bolts. The design of the bolting shall ensure positive locking and ready disassembly. Bolting shall not extend above the upper grating surfaces.

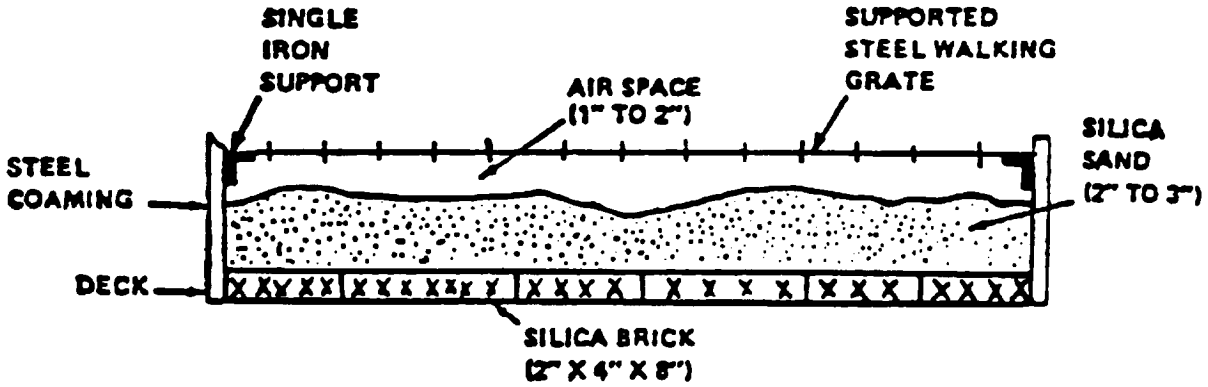


Figure 634-3-7. Cross-Sectional Sketch of Foundry Deck Installation

634-3.21 SLIP-RESISTANT SELF-ADHESIVE TREADS

634-3.21.1 GENERAL. Slip-resistant self-adhesive treads have pressure-sensitive adhesive on their backs and can be installed satisfactorily over bare steel, wood, well-dried (minimum 48 hours air dry) paint and primers, deck tile, and all other deck coverings that are well adhered to the deck. All rust, grease, oil, and dirt must be removed. In addition, deck tile should be cleaned free of residual wax. Three treads with no space between should be installed at the head and foot of ladders, on each side of doors used for continuous traffic, and at both sides of doors in crew messing space (install over deck tile if present). This will protect the deck tile from excessive wear on either side of doors. Slip-resistant treads should not be painted or waxed as this drastically reduces their slip-resistant properties. To increase the traction on sheet or deck tile covering, slip-resistant treads should be cemented directly over the basic deck covering. Required materials are nonslip deck treads conforming to MIL-D-17951 as follows:

a. NSN 9G 7220-00-205-0389; or, 6 by 24 inches, black.

b. NSN 9G 7220-00-205-0390; 24–inch roll.

634-3.21.2 INSTALLATION. This deck covering does not require a separate adhesive because the back has a pressure-sensitive adhesive protected by a plastic liner. To facilitate liner removal, rub the rough surface of a

piece of the deck covering against the edge of the liner in the direction of removal. This will lift the edge, and the liner can then be removed easily. Apply the tread or sheet to the deck and roll with a weighted roller. To waterproof the edges, seal with beading sealer, MIL-D-17951. When installing sheet material, leave a 1/16-inch expansion space between adjoining sheets and between sheets and bulkheads of coamings. Traffic can be permitted over the area after the sealer has dried hard.

634-3.21.3 REPAIR. Replace damaged treads as follows:

a. Over steel or aluminum, remove the damaged sections by scraping or chipping and mechanically abrade the deck to shiny metal. Reprime the deck and replace the treads as soon as surface is dry.

b. Over deck tile or resilient sheet, remove as much of the tread as possible without damaging the existing tile or sheet material. Replace with new treads.

634-3.22 SLIP-RESISTANT DECK COVERING

634-3.22.1 WOOD DECKING. Wood sheathing on steel decks should comply with NAVSEA dwg No. 805-921806.

634-3.22.2 REPAIR. Emergency repair of gouged-wood, flight deck planking:

1. As an alternate to the use of a metal plate for temporary repairs of small gouges to wood deck planking in the landing areas, latex underlay, MIL-D-3135, Type II for an epoxy repair compound listed in **NSTM Chapter 631** may be utilized.

2. Scrape hole or gouged section down to bare wood and remove dust and loose scrapings. Apply underlay in accordance with paragraph 634-3.7 and level off smooth. Protect from rain and traffic at least overnight.

634-3.22.3 VARNISHING. Interior wood decks in passageways on wood ships such as minesweepers may be varnished instead of installing vinyl tile or sheeting. After the wood surface has been properly prepared by sanding and removal of old decking materials, repair and caulk seams and damaged areas as necessary. Apply at least three coats of varnish Formula 80. Allow sufficient drying time between coats. Follow same safety precautions as for painting.

634-3.22.4 WOOD GRATINGS. Wood gratings should be constructed of Douglas fir lumber, 3/4-inch by 4 or 6 inches with 2- by 4-inch bearers, spaced at 18 inches. Gratings should be varnished in accordance with **NSTM Chapter 631** .

634-3.23 POLYURETHANE DECK OVERLAY FOR EXTERIOR METAL OR WOOD DECKS

634-3.23.1 GENERAL. Thick film polyurethane is especially useful on wood flight decks and minesweepers where leakage and mechanical wear are always a problem. Coatings described in paragraph 634-3.7 are used for wood, and so forth.

634-3.23.1.1 Criteria for Plank Replacement. The need for plank replacement on carrier flight decks should be determined based on the following criteria.

a. Wood planks should be surfaced with Tennant (scarifying) machines parallel to grain to remove nonskid and lightly sanded to a bare-wood surface for visual inspection.

b. The following are reasons for replacing flight deck planks: (a) forward-aft cracks or extensive splitting athwartship; (b) badly decayed and punky deck planks - determine by use of ice pick or thin coring tool; (c) deep grain separation - if grain removed would bring plank below 2-1/2-inches thick; and (d) if planks are less than 2-1/2-inches thick on 4.2-pound plate. Remove only portion of plank affected to nearest longitudinal.

c. To maintain maximum thickness of planks, do not sand all planks or localized areas in planks down to the lowest sanded level. PR-1539 gray will fill low spots to a uniform level.

d. Planks do not have to be replaced for localized type gouging or for poor surface appearance unless structural strength is suspect.

634-3.23.1.2 Surface Preparation. Old wooden decks should be surfaced to sufficiently remove any loose or rotted wood fibers. If loose fibers are not removed, they will raise when wetted by PR 1539U Gray and become wicks to permit moisture penetration of protective coating. Generally, the use of the Tenant machine equipped with a spur tool is sufficient to prepare the wood. New deck planking requires only planing or sanding to level off existing planks. Prepare surfaces as follows:

a. All wood dust resulting from surfacing operations should be removed by vacuuming.

b. Grease or oil spots, which remain after surfacing, must be scrubbed with an organic solvent. 1.1.1 Trichloroethane (Methyl Chloroform) is satisfactory. Permit area to dry at least 2 hours at ambient conditions before applying any primer where solvent is utilized.

c. Metal surfaces should be cleaned by sandblasting or grinding to obtain a corrosion-free surface. If surface is oily, degreasing should precede sandblasting or grinding. Prime cleaned surfaces immediately.

d. All terminating boundaries (between tiedowns and planks, bounding bars and planks, landing lights and planks) should be routed out to 1/2-inch wide by 3/4-inch deep against the metal boundary. Fill the joint with polyurethane caulking compound, PR 3095, to be level with the plank surface. Oakum interference in seams should be driven in. All metal surfaces should be cleaned to bright metal. Prime clean sides of tiedown fittings with wash primer 117 or other NAVSEA-approved primer. Apply compound conforming to MIL-I-3064, type HF, around or along terminating boundaries to form a dam so topcoat will not flow into undesired areas such as tiedown fittings or to permit proper buildup to topcoat.

e. Caulking compound that has no adhesion and can be readily pulled loose should be removed and the joint filled with MIL-S-24340 rubber caulk level with plank surfaces. Rubber caulking compounds firmly attached to the deck do not have to be removed. However, the best practice is to cut out a 1/2-inch depth minimum of the marine glue and fill at time of coating with MIL-S-24340.

f. Old wood decks should be permitted to dry out as much as possible before application of primer (at least 36 hours of drying should elapse after a rainstorm before application of primer, if the deck had been exposed to rain during that period; this time may be shortened by artificially drying the surface). Surface can be probed with moisture detector to 1/8-inch depth and if indicated that surface moisture content is less than 28 percent, primer can be applied. Shade covers over plank areas are recommended during primer application.

634-3.23.1.3 Temperature Conditions. The material generally should not be applied below 10°C (50°F) ambient temperature. However, the low temperature problem may be overcome by heating a covered area.

634-3.23.1.4 Sun Shade. The area to be worked should be covered to provide shade. Shading may be necessary because heat from the sun expands entrapped moisture or gases in the old planks. The PR 1539U, while still in its gel state, lacks the strength to prevent a blistering effect on its surface from the liberated gases and moisture. It is desirable to keep the deck surface temperature below 38°C (100°F) at all times. The sun shade cover is installed before priming the deck so setup time will not interfere with other operations and left at least 72 hours after priming. The sun shade cover should be constructed to permit air circulation under the area covered. To improve air circulation, air movers could be used. Some successful applications have been made without a cover. This probably depends upon atmospheric conditions and moisture condition of wood planking. The chances of achieving a successful coating application without a cover are better if the temperature is falling or rising only slightly.

634-3.23.1.5 Deck Covering Thickness. In general, a minimum thickness of 1/8 inch should be applied except in areas of high impact where a special thickness is necessary to absorb the energy of repeated blows. Caulking seams must be completely and thoroughly covered.

634-3.24 NON-SKID DECK COVERINGS

634-3.24.1 Non-skid deck coverings are high performance, textured, organic materials which are applied to steel, aluminum, Glass Reinforced Plastic (GRP), and wood as a slip-resistant surface for personnel vehicles, and aircraft. Depending on the required profile and the type of product being used, non-skid can be applied by spraying, rolling or troweling.

634-3.24.2 Most non-skid systems consist of a primer, non-skid topcoat and color topping. Some non-skid systems have an intermediate coat (underlayment) (Type III only) which is applied after the primer and before the non-skid. The primer is applied to provide a base for the topcoat and to protect the substrate from corrosion. There are non-skid systems qualified to MIL-PRF-24667 which do not require an application of primer before non-skid is installed. The non-skid topcoat has a functional purpose, to provide slip resistance for personnel, vehicles and aircraft. The color topping is also functional, although it is often misused for aesthetic reasons. Color topping is for visual landing aid (VLA) and safety markings only (see paragraph 634-3.31).

634-3.24.3 Non-skid systems covered herein include those to be applied in the following area:

a. Flight decks
b. Carrier landing areas
    1. Metal decks
    2. Wooden decks
c. Aircraft Elevators
d. Hangar decks
e. Passageways
f. Weather decks
g. Vertical replenishment (VERTREP) and Helicopter in-flight refueling (HIFR) areas
h. Weather deck ammunition areas
i. Weapon operational areas

j. Ammunition/ordnance areas

k. Other deck areas
   1. Metal
   2. Wood

634-3.25 NON-SKID SPECIFICATIONS

634-3.25.1 MIL-PRF-24667 This specification addresses non-skid systems for application to weather decks, flight decks, hangar decks and other areas requiring non-skid. The coatings can be applied to steel, aluminum, GRP and wooden decks by spraying, rolling, or troweling. Non-skid products qualifying to this specification are of the following types:

a. Type I - High durability, rollable deck coating

b. Type II - Standard durability rollable or trowel deck coating

c. Type III - Standard durability, rollable resilient deck coating for use on exterior wooden decks, GRP, or metal decks where flexibility is required and where increased weight is not a factor.

d. Type IV - Standard durability, sprayable deck coating.

634-3.25.1.1 The types are also subcategorized to define composition:

a. G - General use abrasive deck coating (Types I, II, III, and IV)

b. L - Limited use non-abrasive (Aircraft carrier landing area, Types I and II only)

634-3.25.1.2 Table 634-3-3 lists the application areas for MIL-PRF-24667 non-skid materials.

634-3.25.1.3 The following lists the minimum service lives of MIL-PRF-24667 non-skid materials on aircraft carrier flight decks. These non-skid materials may provide longer service in other types of applications.

Type	Composition G (months)	Composition L (landings)
I	12	10,000
II	6	5,000
III	6	-----
IV	6	-----

634-3.25.1.4 Approved non-skid NSN are:

MIL-PRF-24667

TYPE I, High Durability, rollable deck coating

Comp G, General-Use Abrasive Deck Coating
8010-01-397-3802 KT (5 GL) Dark Gray 36076

Comp L, Limited-Use Non-Abrasive Deck Coating
8010-01-397-3804 KT (5 GL) Dark Gray 36076

Type II, Standard Durability, Rollable of Trowel Deck Coating
Comp G, General-Use Abrasive Deck Coating
8010-01-397-3806 KT (5 GL) Dark Gray 36076
8010-01-397-3807 KT (5 GL) Haze Gray 26270
8010-01-397-3820 KT (5 GL) Black 37038
8010-01-397-3822 KT (5 GL) White 37875
8010-01-397-3984 KT (5 GL) Olive Drab 34088

COMP L, Limited-Use Non-Abrasive Deck Coating
8010-01-397-3808 KT (5 GL) Dark Gray 36076

Primer
8010-01-397-3986 KT (1 GL) Dark Gray (Approx. 26008)
8010-01-397-3810 KT (5 GL) Dark Gray (Approx. 26008)
8010-01-397-3987 KT (1 GL) Light Buff (Approx. 22516)
8010-01-397-3811 KT (5 GL) Light Buff (Approx. 22516)

Color Toppings
8010-01-397-3812 KT (5 GL) White 37875
8010-01-397-3814 KT (5 GL) Yellow 33538
8010-01-397-3815 KT (5 GL) Red 31136
8010-01-397-3816 KT (5 GL) DK Gray 36076

NSN's for Types III and IV will be provided once GSA has established a supply demand for these items.

Table 634-3-3. APPLICATION AREA/PRODUCT TYPES

Ship Type	Area	MIL-PRF-24667
Carriers	Flight deck impact, runout areas and catapult tracks (metal decks)	Type I or II, Comp L
Carriers	Hangar deck, flight deck traffic parking areas and aircraft elevators (metal decks)	Type I or II, Comp G
Air-capable	Hangar decks and helipads (excluding skid-configured landing zones and vehicle storage areas)	Type I or II, Comp G
Air-capable	Helipads (skid-configured landing zones)	Type I, Comp G
Air-capable	Flight decks (metal decks) (excluding carriers)	Type I or II, Comp G
All Ships	All vertical replenishment areas, weather decks, exterior passageways, and interior decks (metal decks)	Type I or II, Comp G, or Type IV
VLS-Configured Ships	MK41 Launcher top covers	Type I, Comp G
NOTES:		
1. Type III non-skid systems are intended for use only on wooden decks or where flexibility or thick smoothing capability is needed to correct drainage. Type III non-skid is not intended to be used on aircraft carriers if the underlayment is used due to compressibility of the materials under heavy aircraft. Use NAVSEA approved system qualified under performance specification MIL-PRF-24667, Type III.		
2. Type I non-skid provides longer durability than Type II non-skid, however the factor of increased weight should be considered when using this system.		
3. Comp L non-skid can be used in place of Comp G non-skid outside the landing areas (with TYCOM approval).		

634-3.25.2 ABLATIVE NON-SKID If a missile blast area projects into the helicopter flight deck, VERTREP or HIFR area, a non-skid version of the ablative deck covering applied in the blast area (Flexfram 605 N/S ablative non-skid) is acceptable for the helicopter deck projection. Do not apply non-skid materials over the ablative

deck covering (Flexfram 605TH) as the non-skid will crack. Follow manufacturer's published guidelines when installing the ablative non-skid. Thinning of this non-skid, or any non-skid product, is prohibited.

634-3.26 ENVIRONMENTAL CONDITIONS

634-3.26.1 GENERAL. The environmental conditions listed in Table 634-3-4 shall be met during surface preparation and the application of primer, non-skid and color topping. If difficulties are encountered in meeting the required conditions, it will be necessary to either erect an environmental structure which can control humidity and temperature levels or to halt work until the required conditions are met.

634-3.26.1.1 A manufacturer's representative shall be made available on site during deck preparation, application of primer, and application and curing of the non-skid as required by the applicator, contractor, or government.

634-3.26.2 STORAGE TEMPERATURES. Long term storage temperatures for non-skid products must fall within the range recommended in Table 634-3-4. If this range is different from that published in the manufacturer's American Society for Testing and Materials (ASTM) Standard Shipbuilders and Marine Paints and Coatings Product/Procedure Data Sheet (F-718), the manufacturer's ASTM F-718 sheets supersede what is listed. If this requirement is not followed, the non-skid system's inherent properties may be altered.

Table 634-3-4. REQUIRED ENVIRONMENTAL CONDITIONS[1]

Environmental Condition	Minimum	Maximum
Component Storage Temperature -Long Term[2] -24 hours prior to mixing (non-skid/primer/color topping)	55°F 70°F	100°F 80°F
Ambient Air Temperature [2]	55°F	100°F
Deck Temperature [2]	55°F	100°F
Relative Humidity	----	85%
Dew Point	The deck temperature must be at least 5°F above the dew point.	
Wind [3]		

[1.] The environmental conditions listed are required during surface preparation and the application of primer, intermediate coat (underlayment), non-skid, and color topping.

[2.] If the application or long term storage temperature ranges specified in the manufacturer's ASTM F-718 sheet differ from this range, the manufacturer's guidelines shall be followed.

[3.] Wind should be monitored during the application of non-skid systems to prevent contamination. Wind velocity, if too great, can also decrease the wet film build during the application of primer by conventional air assist or airless spray methods. Do not apply non-skid or primer, and do not use spray application, if wind velocity at the application site is sufficient to interfere with the application.

634-3.26.3 AMBIENT AIR TEMPERATURE. The ambient air temperature shall be measured to ensure that the non-skid system is not being applied under adverse conditions. If application of non-skid or primer is performed while the temperature is lower than the required minimum, the curing time will increase significantly. Application of non-skid or primer when temperatures are too high can result in solvent entrapment and possible

failure of the coating system. Extremely high temperatures will also cause the non-skid peak profile to ″slump.″ Although Table 634-3-4 lists a required air temperature range, the temperature range specified in the manufacturer's ASTM F-718 sheets supersede what is listed.

634-3.26.3.1 The ambient air temperature can be measured directly by using a thermocouple, a thermometer, a psychrometer, or a Psychro-Dyne. If a psychrometer or Psychro-dyne is being used, the ambient air temperature is the dry bulb temperature. See paragraphs 634-3.34.2 through 634-3.34.3 for use of equipment.

634-3.26.4 DECK TEMPERATURE. The deck temperature shall be measured to ensure that the non-skid system is applied within the proper temperature range. If application of non-skid or primer is performed while the temperature is lower than the required minimum, the curing time will increase significantly. Application of non-skid or primer when temperatures are too high can result in solvent entrapment and possible failure of the coating system. High temperatures can also cause the non-skid peak profile to ″slump.″ Although Table 634-3-4 lists a required deck temperature range, the temperature range specified in the manufacturer's ASTM F-718 sheets supersede what is listed.

634-3.26.4.1 The deck temperature can be measured directly by using a surface thermometer (such as a rail thermometer) or a thermocouple. See paragraph 634-3.34.1 for use of equipment.

NOTE

The temperatures of the coolest and warmest areas of the deck shall be taken since the surface temperature varies over a given area.

634-3.26.5 HUMIDITY Humidity has a substantial impact on surface preparation and the curing of coatings. The 85% maximum relative humidity requirement is an accepted standard in industry and in the technical literature. Metal substrates corrode much more rapidly when the humidity level exceeds the 85% limit. Also, when the maximum limit is surpassed, the cure of epoxy paints (the most common system type on the current qualified products lists, QPL) is slowed and sometimes altered. The result can be blooming or blushing (formation of a film on the surface of the paint), followed by the failure of the coating system. See Figure 634–3–8 for the maximum exposed deck time based on humidity.

634-3.26.5.1 Humidity can be measured by using a psychrometer, Psychro-Dyne, or a Hygro-Thermometer. The psychrometer and Psychro-Dyne measure wet and dry bulb temperatures. After obtaining these temperatures, the humidity can be found by using the psychrometric charts (Figure 634-A-1 in Appendix A), or the charts published by the National Weather Service. See paragraphs 634-3.34.2 and 634-3.34.3 for use of equipment. Appendix A illustrates a sample calculation.

634-3.26.6 DEW POINT The dew point is critical during surface preparation and the application of coatings. The dew point is the temperature at which water will condense on a surface at a given humidity. Since water will condense on contaminants even though the substrate temperature is above the dew point, it is required that the substrate temperature of the coldest spot in the working area be at least 5°F above the dew point temperature throughout any surface preparation or painting operation.

634-3.26.6.1 The presence of moisture on metal (aluminum, steel, etc) and GRP substrates will accelerate corrosion. Moisture on wood decks can lead to moisture entrapment and rot formation.

634-3.26.6.2 Moisture will alter the polymerization of epoxies. The result can be blooming or blushing (formation of a film on the surface of the paint). When this film forms, it can cause an intercoat failure (two coatings which fail to bond together).

634-3.26.6.3 The dew point temperature can be obtained by determining the wet and dry bulb temperatures. These temperatures are found by using a psychrometer, Psychro-Dyne or a Hygro-Thermometer. Once the wet and dry bulb temperatures have been determined, the psychrometric charts or the charts published by the National Weather Service can be used to find the dew point temperature. See paragraphs 634-3.34.2 and 634-3.35.3 for use of equipment. Appendix A illustrates a sample calculation.

634-3.26.7 WIND VELOCITY. Wind velocity should be monitored during all painting operations. Personnel should be aware that when wind velocity is high, contaminants can blow onto the surface, overspray and dry spray can occur, and the rate of solvent evaporation can be accelerated. An increase in the solvent evaporation rate can result in pinholes, leading to a coating failure. When overspray occurs, an uneven film build will be obtained. It is also possible that the dry film thickness required in paragraph 634-3.28.10 will not be achieved.

634-3.26.7.1 All environmental conditions shall be measured at the site and at deck level. Do not rely on weather forecasts or consultation with weather stations.

634-3.26.7.2 If excessive wind conditions exist, consideration should be given to roller application to preclude paint damage to adjacent areas, such as ships, automobiles, etc.

634-3.27 SURFACE PREPARATION

634-3.27.1 There are many surface preparation methods. They include abrasive blast cleaning, power tool cleaning, and hydroblasting. Pickling (acid etch) is not a NAVSEA approved procedure for non-skid installations. Abrasive blast cleaning methods have traditionally been the most commonly employed because they have yielded the highest degree of deck cleanliness with a reasonable production rate.

634-3.27.1.1 Abrasive blast cleaning encompasses direct-pressure blast (open blast), vacuum-blast cleaning. The open blast process poses difficulties in containing the blast medium (aluminum oxide, garnet, etc.) and requires significantly longer clean-up times compared with the use of a vacuum system. Also, an open blast requires that a full protective suit with a fresh air source be worn because of all the debris in the air; whereas when vacuum blasting is performed, only safety glasses, ear protection and a dust mask as specified by the safety officer needs to be worn. The primary advantage of steel shot centrifugal-wheel vacuum-blast cleaning is that this type of equipment saves a lot of time in large open areas since the blast track is large and the shot is contained and recirculated. Since poor surface preparation is the cause of most coating failures, the procedures outlined herein shall be followed. Since abrasive blast cleaning methods yield the highest degree of deck cleanliness, they are the most commonly employed.

634-3.27.1.2 Hydroblasting relies on the energy of fresh water striking a surface to remove the existing coating. This technique eliminates dust pollution and disposal requirements for spent abrasives. High Pressure (HP) hydroblasting operates at pressures between 680 to 1,700 bar (10,000 to 25,000 psi) and Ultra High Pressure (UHP) operates at pressures above 1,700 bar (25,000 psi). The primary advantages of hydroblasting include no dust pollution, significantly less waste to dispose, elimination of foreign object damage hazard (steel shots not used), and less disruption of other ship work in the vicinity of the non-skid work. The hydroblast facility shall comply with all local, state, and federal regulations regarding the proper storage, use, collection, and disposal of

all abrasive materials. Compliance with the requirements of the Clean Air Act and Clean Water Act amendments are the responsibility of the hydroblast facility. Water from hydroblast operations shall meet Clean Water Act requirements before being disposed of into surface waters.

NOTE

Hydroblasting equipment available today will not provide adequate production to comply with CIS contract requirements to remove 7,000 to 10,000 square feet per day.

634-3.27.2 STEEL SURFACES. The environmental conditions addressed in paragraph 634-3.26 shall be met from the beginning of surface preparation until the surface being prepared has been completely painted. All data shall be recorded at least hourly to ensure that the aforementioned requirement is met.

634-3.27.2.1 Equipment which may be damaged during abrasive blasting shall be protected, including lights, electrical cables, 1MC/5MC/SMC/speakers, damage control equipment, catapult tracks, appropriate areas of RAST (see paragraph 634-3.29.7, step 3) tracks, deck drains and water washdown systems. Deck drains shall be sealed with damage control plugs or other suitable equipment. Deck drains shall be tested following the completion of the non-skid installation to ensure that the drains are not clogged. Plywood or net barriers shall surround the area being blasted to contain stray steel shot. When net barriers are used, the mesh size of the netting material shall be small enough to ensure that the steel shot will be contained. In addition, net barriers, when used, shall be overlapped where attached to stanchions, and anchored at the bottom for the entire net's length between stanchions. This will limit the clean-up and localize the blast medium. Steel shot on a deck is a foreign object damage (FOD) hazard.

634-3.27.2.2 All abrasively blasted steel surfaces shall be prepared to a near-white finish, or better, as defined by the National Association of Corrosion Engineers (NACE) or Steel Structures Painting Council (SSPC) (Table 634-3-5 and Table 634-3-6). Steel shot centrifugal-wheel vacuum-blast cleaning is the most commonly employed surface preparation method because it yields a high degree of deck cleanliness and most of the blast medium is contained and recirculated (see Figure 634-3-9). Extreme care shall be taken to ensure that all shot is removed from the surface before painting, and that no shot is caught in joints, cracks near hangar doors, or wedged in crevices. Steel shot shall conform to Military Specification MIL-S-851D.

634-3.27.2.2.1 If surface preparation is to be accomplished by hydroblasting, only a closed-loop system shall be employed. Acceptance criteria for surface preparation shall be in accordance with NACE No. 5/SSPC-SP12. When viewed without magnification, the surface shall be free from visible oil, grease, dirt, loose rust, paint coatings, and foreign matter except for staining. Staining shall be limited to no more than five (5) percent of each square inch of surface area hydroblasted and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of MIL scale, or stains of previously applied paint. There shall be no flash rusting. Painting shall be accomplished before the steel begins to rust. The use of corrosion inhibitors is prohibited.

634-3.27.2.3 Areas which the centrifugal blast or hydroblast equipment cannot access (deck coaming, deck edges) shall be prepared to a surface cleanliness of SSPC-SP-11, as defined in Table 634-3-6. The following power tools, discussed in Table 634-3-7, may be used: Descobraders, power rotary brush, scaling hammers, needle scalers, sanders and grinders.

WARNING

Wear proper protective equipment during surface preparation (blasting, power tool cleaning), including appropriate eye, ear, and respiratory protection. Safety officer shall be consulted.

NOTE

Power rotary brushes when used alone will not produce the required surface profile and may remove or degrade an existing profile to an unacceptable level.

634-3.27.2.4 The storage temperatures 24 hours prior to application (listed in Table 634-3-4) are more stringent than long term storage temperature requirements because if the materials are too cold, and application is performed in cool weather, the curing time will increase significantly. Also, if not properly conditioned the epoxy/catalyst reaction will be slow and may not happen. Conversely, if storage temperatures are high, and application is performed in warm weather, the non-skid peak profile will ″slump,″ and the non-skid will cure too fast.

634-3.27.2.5 A 3 to 4.5 mil anchor tooth profile shall be obtained for surfaces abrasively blasted. The depth of the profile is dependent upon the size of the blast medium and the speed of the blasting equipment. The deck profile shall be measured by using replica tape. Replica tape, such as Testex PRESS-O-FILM, used in conjunction with a micrometer yields the most accurate measurement. Three profile readings shall be taken every 100 ft^2 for the first 500 ft^2 . If the readings are consistent, only one reading every 1000 ft^2 need be taken thereafter. See paragraph 634-3.34.4 for use of Testex PRESS-O-FILM.

634-3.27.2.6 The underside of aircraft securing fittings shall be checked with a dental mirror, or similar instrument, to ensure that all corrosion has been removed.

NOTE

Replica tape used to measure the surface profile shall be retained as a permanent record. The tape shall be available during the final acceptance of the non-skid installation.

634-3.27.2.6.1 Hydroblasted surfaces will retain the surface profile of prior surface treatments. In areas where the substrate may have been smoothed, abrasive blasting may be required to achieve the required 3 to 4.5 mil anchor tooth profile.

Table 634-3-5. NACE ABRASIVE BLAST CLEANING STANDARDS

Standard	Definition
NACE No. 1 White Metal	This finish is defined as a surface with a gray-white, uniform metallic color, slightly roughened to form a suitable anchor pattern for coatings; this surface shall be free of all oil, grease, dirt, visible mill scale, rust, corrosion products, oxides, paint, or any other foreign matter; the surface shall have a color characteristic of the abrasive media used.

Table 634-3-5. NACE ABRASIVE BLAST CLEANING STANDARDS -

Continued

Standard	Definition
NACE No. 2 Near-White Metal	This finish is defined as one from which all oil, grease, dirt, mill scale, rust, corrosion products, oxides, paint, or other foreign matter have been removed from the surface except for very light shadows, very slight streaks, or slight discolorations; at least 95% of the surface shall have the appearance of a surface blast cleaned to a white metal surface finish and the remainder shall be limited to the light discoloration mentioned above.
NACE No. 3 Commercial Blast	This finish is defined as one from which all oil, grease, dirt, rust scale, and foreign matter have been completely removed from the surface and all the rust, mill scale, and old paint have been completely removed except for slight shadows, streaks, or discolorations; if the surface is pitted, slight residues of rust or paint may be found in the bottom of pits; at least two-thirds of the surface areas shall be free of all visible residues and the remainder shall be limited to light discoloration, slight staining, or light residues mentioned above.
NACE No. 4 Brush-off Blast	This finish is defined as one from which oil, grease, dirt, rust scale, loose mill scale, loose rust, and loose paint or coatings are removed completely, but tight mill scale and tightly adhered rust, paint and coatings are permitted to remain provided they have been exposed to the abrasive blast pattern sufficiently to expose numerous flecks of the underlying metal fairly uniformly distributed over the entire surface.
NACE/SSPC	Joint Surface Preparation Standards
NACE No. 1/ SSPC-SP 5	White Metal Blast Cleaning
NACE No. 2/ SSPC-SP 10	Near-white Metal Blast Cleaning
NACE No. 3/ SSPC-SP 6	Commercial Blast Cleaning
NACE No. 4/ SSPC-SP 7	Brush-off Blast Cleaning
NACE No. 5/ SSPC-SP 12	Surface preparation of steel and other hard materials by high- and ultra- high pressure water jetting prior to recoating.
Definitions for these standards are not yet available. NAVSEA has ordered materials from NACE.	

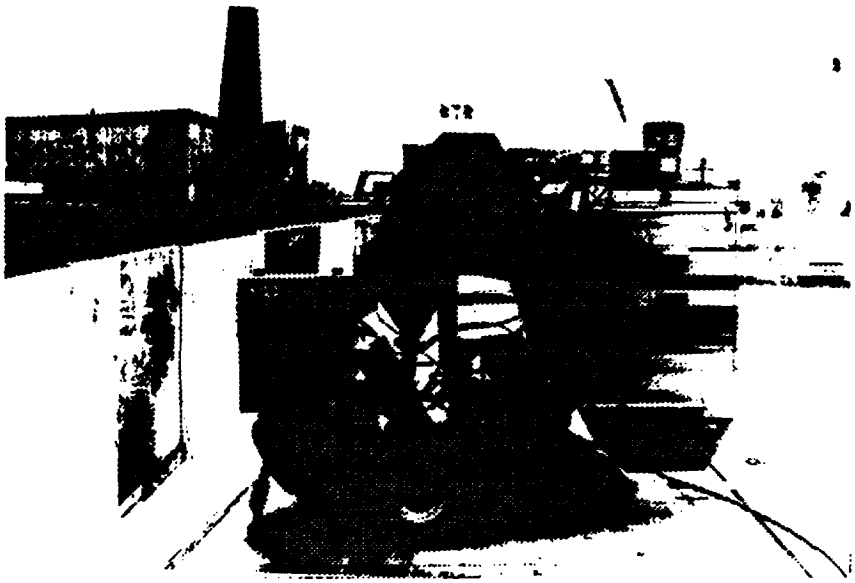
Table 634-3-6. STEEL STRUCTURES PAINTING COUNCIL STANDARDS

Standard	Definition
SSPC-SP-11-87T Power Tool Cleaning to Bare Metal	Removal of all rust, loose mill scale, and paint to bare metal, except for slight residues in pits if the surface is pitted, by chipping, scraping, sanding or wire brushing. A minimum of a one-mil profile is required.
SSPC-SP-5 White Metal	A white metal finish is defined as a surface with a gray-white, uniform metallic color, slightly roughened to form a suitable anchor pattern for coatings. The surface, when viewed without magnification, shall be free of all oil, grease, dirt, visible mill scale, rust, corrosion products, oxides, paint, or any other foreign matter. The color of the clean surface may be affected by the particular abrasive medium used.

Table 634-3-6. STEEL STRUCTURES PAINTING COUNCIL STANDARDS

- Continued

Standard	Definition
SSPC-SP-10 Near-White Metal	A near-white finish is defined as one from which all oil, grease, dirt, mill scale, rust corrosion products, oxides, paint or other foreign matter have been completely removed from the surface except for very light shadows, very slight streaks, or slight discoloration caused by rust stain, mill scale oxides, or slight, tight residues of paint or coating that may remain. At least 95% of each square inch of surface area shall be free of all visible residues, and the remainder shall be limited to the light discoloration mentioned above.
SSPC-SP-6 Commercial Blast	A commercial finish is defined as one from which all oil, grease, dirt, mill scale, rust corrosion products, oxides, paint, or other foreign matter have been completely removed from the surface except for very light shadows, very slight streaks, or slight discolorations caused by rust stain, mill scale oxides, or slight, tight residues of paint or coating that may remain; if the surface is pitted, slight residues of rust or paint may be found in the bottom of the pits; at least two-thirds of each square inch of surface area shall be free of all visible residues and the remainder shall be limited to light discoloration, slight staining or tight residues mentioned above.
SSPC-SP-7 Brush-off Blast	A brush-off finish is defined as one from which all oil, grease, dirt, rust scale, loose mill scale, loose rust and loose paint or coatings are removed completely, but tight mill scale and tightly-adhered rust, paint and coatings are permitted to remain provided that all mill scale and rust have been exposed to the abrasive blast pattern sufficiently to expose numerous flecks of the underlying metal fairly uniformly distributed over the entire surface.



A steel shot centrifugal-wheel vacuum blast machine, like the one shown above, is used to remove old non-skid systems and to prepare the deck so that the proper surface roughness (deck profile) and deck cleanliness are obtained. This type of equipment saves a lot of time in large open areas since the blast track is wide, usually 6 to 24 inches. Also, clean-up is simplified when using this type of equipment. The majority of the blast medium (steel shot) is recovered and recirculated. (NOTE: All steel shot shall be removed from the substrate before painting proceeds.)

Figure 634-3-9. Steel Shot Centrifugal-Wheel Vacuum Blast Cleaning

Table 634-3-7. POWER TOOLS

Tool	**Use**
Pneumatically Driven Tools (hammers/rotary hammers)	Dislodge stubbornly adherent materials
Scalers (chisels, needle guns)	Remove all mill scale, rust, weld slag and paint. Effective in crevices, pits and grooves.
Rotary Impact Tools (Descobraders, deck crawlers)	The flap wheel (roto peen) fractures and removes coatings and mill scale. Also, the substrate is peened, giving a one-mil minimum profile.
Wire Brushes	Remove paint, loose mill scale and weld slag. Smooth the surface (may need additional tools to roughen the surface).
Grinders or Sanders Equipped with Coated Abrasive	Removes paint, loose mill scale, and rust. Remove some substrate.

634-3.27.2.7 After preparation of the surface is completed, the substrate shall be free of the following:

a. Contaminants

b. Weld splatter

c. Skip welds (welds which are not continuous)

d. Rough welds (weld shall be smoothed as porosity allows for corrosion)

e. Laminations

f. Gouges

g. Sharp edges

h. Stray steel shot and other abrasives

i. Weld slag

If contaminants (dirt, dust, grease, oil) are present, they shall be removed by using the non-skid manufacturer's recommended solvent which is compatible with their non-skid system. When using compressed air to remove dirt and dust, care shall be taken to ensure that the air is both water and oil free.

NOTE

If solvents are used, ensure that all local, state and federal volatile organic content (VOC) laws are observed.

WARNING

The solvent manufacturer's Material Safety Data Sheet (MSDS) shall be consulted for health and safety precautions.

634-3.27.2.7.1 For surfaces which have been abrasively blasted or hydroblasted, in addition to the requirements of paragraph 634-3.27.2.7, a check for contamination of the substrate shall be taken. A surface chloride contamination check using the Bresle Patch Method or equivalent shall be made randomly over the abrasively blasted or hydroblasted surface. One measurement per 1000 square feet shall be made. If any direct measurement exceeds 5 micrograms per square centimeter of chloride, the substrate shall be blasted again until the chloride measurement is below 5 micrograms per square centimeter. For surface areas less than 1000 square feet, at least one random measurement is required.

634-3.27.2.8 Steel surfaces shall be painted within the maximum time allowed with respect to the humidity level, in accordance with Figure 634–3–8. For additional discussion, see paragraph 634–3.27.5. If this requirement is not met, a brush blast must be performed to remove any superficial flash rust which may have formed. The surface must be free of any rust before painting can proceed.

NOTE

Naval activities shall dispose of spent abrasive, dust, removed non-skid and solvents in accordance with OPNAVINST 5090.1, **Natural Resources Protection Manual** and **NSTM Chapter 593, Pollution Control** . Private contractors shall dispose of waste in accordance with local, state, and federal laws.

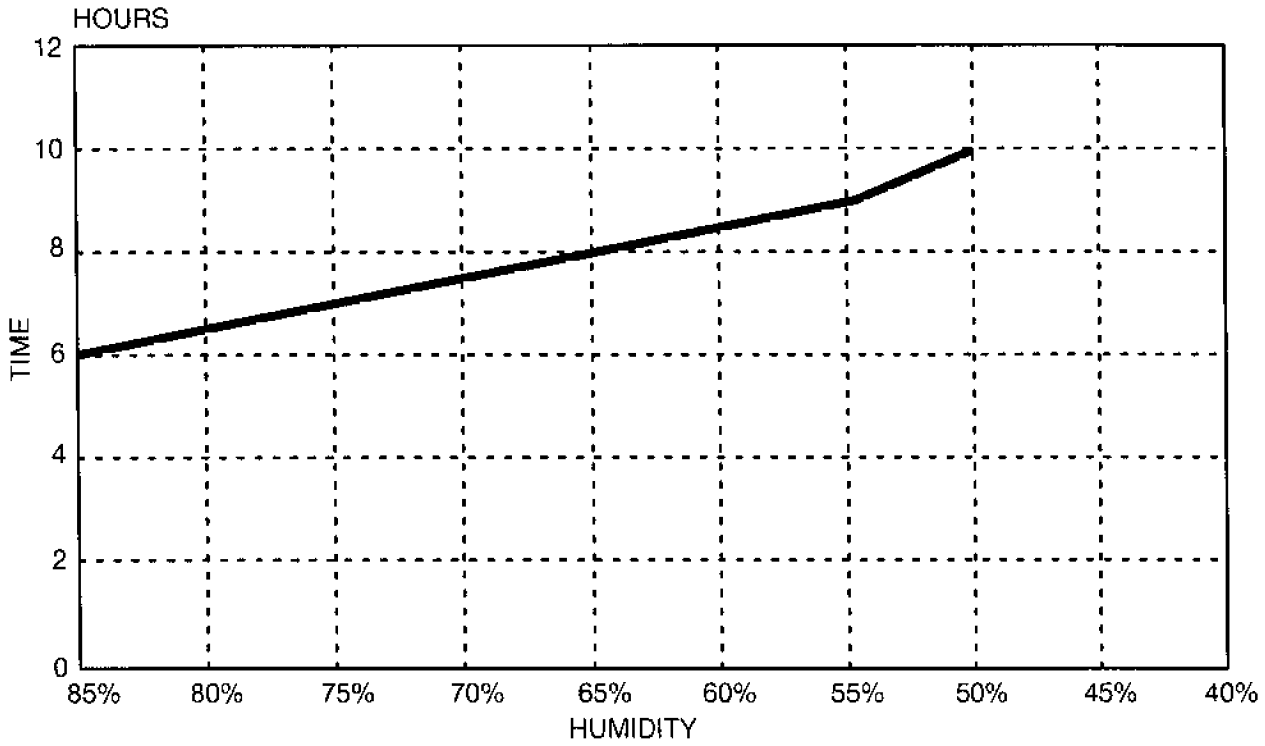


Figure 634-3-8 Maximum Exposed Deck Time Based Upon Humidity

634-3.27.3 ALUMINUM SURFACES. The environmental conditions addressed in paragraph 634-3.26 shall be met from the beginning of surface preparation until the surface being prepared has been completely painted. All data shall be recorded at least hourly to ensure that the aforementioned requirement is met.

NOTE

Spirit thermometers (mercury-free) or electronic devices, shall be used to measure temperatures. Mercury in contact with aluminum results in severe cracking due to liquid embrittlement.

634-3.27.3.1 Equipment which may be damaged during abrasive blasting shall be protected, including lights, electrical cables, 1MC/3MC/5MC/speakers, damage control equipment, deck drains, appropriate areas of RAST tracks (see paragraph 634-3.29.7) and water washdown systems. Deck drains shall be sealed with damage control plugs or other suitable equipment. Deck drains shall be tested following the completion of the non-skid installation to ensure that the drains are not clogged. Plywood or net barriers shall surround the area being blasted to contain stray blast medium (steel shot, aluminum oxide, garnet and other abrasives). When net barriers are used, the mesh size of the netting material shall be small enough to ensure that the blast medium will be contained. In addition, net barriers, when used, shall be overlapped where attached to stanchions, and anchored at the bottom for the entire net's length between stanchions. This will limit the clean-up and localize the abrasive. Blast medium on a deck is a foreign object damage (FOD) hazard.

634-3.27.3.2 All abrasively blasted aluminum surfaces shall be prepared to a condition similar to a near-white finish, or better, as defined by the National Association of Corrosion Engineers (NACE) or Steel Structures Painting Council (SSPC). See Table 634-3-5 and Table 634-3-6. Steel shot centrifugal-wheel vacuum-blast cleaning is the most commonly employed method of surface preparation because it yields a high degree of deck clean-

liness and most of the steel shot is contained and recirculated; however, steel shot, when in contact with aluminum, will corrode and will accelerate oxidation of the deck due to dissimilar metal effects. Stainless steel shot is preferred over carbon steel shot since stainless steel corrodes at a much slower rate than carbon steel; however, corrosion can still occur. Therefore, extreme care shall be taken to ensure that all carbon steel or stainless steel shot is removed from the surface before painting, and that no shot is caught in joints, cracks near hangar doors, or wedged in crevices. Aluminum oxide, or a similar blast medium, cannot replace steel shot as the blast medium in the centrifugal vacuum blast equipment because the aluminum oxide will destroy internal parts of the machinery.

634-3.27.3.2.1 Do not remove the protective non-skid coating if the area will not be primed within the same day. See paragraph 634–3.27.3.10.

634-3.27.3.2.2 For hydroblasted aluminum surfaces, the International/Courtaulds Marine Paint Company Hydroblasting Standard (International/Courtaulds Document 1/HS/05/94) shall be used pending development of a Steel Structures Painting Council hydroblast cleanliness standard. Aluminum surfaces shall be prepared to International/Courtaulds Standard HB 2 1/2. HB 2 1/2 (very thorough hydroblast) is equivalent to SSPC-SP 10 abrasive blast (near white metal). When viewed without magnification, the surface shall be free from visible oil, grease, dirt, loose rust, paint coatings, and foreign matter except for staining. Staining shall be limited to no more than five (5) percent of each square inch of surface area hydroblasted and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of MIL scale, or stains of previously applied paint. There shall be no flash rusting. Painting shall be accomplished before the aluminum begins to corrode. The use of corrosion inhibitors is prohibited.

634-3.27.3.3 Carbon and stainless steel shot shall conform to Military Specification MIL-S-851D.

634-3.27.3.4 If all of the blast media cannot be readily contained, aluminum oxide, garnet or other non-metallic abrasives (paragraph 634-3.27.3.7) shall be used instead of steel shot.

634-3.27.3.5 Areas which the centrifugal blast or hydroblast equipment cannot access (deck coaming, deck edges) shall be prepared to a surface cleanliness of SSPC-SP-11, as defined in Table 634-3-6. Tools that may be used include grinders or sanders equipped with 16-grit aluminum oxide abrasive pads (Table 634-3-7). Abrasive materials (pads, belts) shall not have been previously used to prepare copper nickel metal for painting or to remove copper base anti-fouling (AF) paints.

634-3.27.3.6 The underside of all aircraft securing fittings shall be inspected with a dental mirror, or similar instrument, to ensure that all corrosion has been removed.

634-3.27.3.7 Alternative methods to centrifugal-wheel vacuum-blast cleaning include direct-pressure blast (open blast), vacuum-blast cleaning, and hydroblasting. Garnet and aluminum oxide are among the permitted blast media. The abrasive materials used for blasting shall conform to Military Specification MIL-A-21380B. Abrasive materials shall not have been previously used on copper containing metals or on AF paints containing copper.

WARNING

Wear proper protective equipment during surface preparation (blasting, power tool cleaning), including appropriate eye, ear and respiratory protection. Safety officer shall be consulted.

634-3.27.3.8 A 3 to 4.5 mil anchor tooth profile shall be obtained for surfaces abrasively blasted. The deck profile is dependent upon the size of the blast medium and the speed of the blasting equipment. The deck profile shall be measured by using replica tape. Replica tape, such as Testex PRESS-O-FILM, used in conjunction with a micrometer yields the most accurate measurement. Three profile readings shall be taken every 100 ft^2 for the first 500 ft^2 . If the readings are consistent, only one reading every 1000 ft^2 need be taken thereafter. See paragraph 634-3.34.4 for use of Testex PRESS-O-FILM.

NOTE

Replica tape used to measure the surface profile shall be retained as a permanent record. The tape shall be made available during the final acceptance of the non-skid installation.

634-3.27.3.8.1 Hydroblasted aluminum surfaces will retain the surface profile of prior surface treatments. In areas where the substrate may have been smoothed, abrasive blasting may be required to achieve the required 3 to 4.5 mil anchor tooth profile.

634-3.27.3.9 After preparation of the surface is completed, the substrate shall be free of the following:

a. Contaminants
b. Weld splatter
c. Skip welds (welds which are not continuous)
d. Rough welds (welds shall be smoothed, porosity allows for corrosion)
e. Laminations
f. Gouges
g. Sharp edges
h. Blast media
i. Weld slag

If contaminants (dirt, dust, grease, oil) are present, they shall be removed by using the non-skid manufacturer's recommended solvent which is compatible with their non-skid system. When using compressed air to remove dirt and dust, care shall be taken to ensure that the air is both water and oil free.

NOTE

If solvents are used, ensure that all local, state and federal VOC laws are observed.

WARNING

The solvent manufacturer's Material Safety Data Sheet (MSDS) shall be consulted for safety and health precautions.

634-3.27.3.9.1 For surfaces which have been hydroblasted, in addition to the requirements of paragraph 634-3.27.3.9, a check for contamination of the substrate shall be taken. A surface chloride contamination check using the Bresle Patch Method or equivalent shall be made randomly over the hydroblasted surface. One measurement per 1000 square feet shall be made. If any direct measurement exceeds 5 micrograms per square centimeter of chloride, the substrate shall be hydroblasted again until the chloride measurement is below 5 micrograms per square centimeter. For surface areas less than 1000 square feet, at least one random measurement is required.

634-3.27.3.10 Aluminum surfaces shall be painted within the maximum time allowed with respect to the humidity level, in accordance with Figure 634–3–8. For additional discussion, see paragraph 634–3.26. If this requirement is not met, a brush blast must be performed to remove any superficial oxidation which may have formed. The surface must be free of oxidation before painting can proceed.

NOTE

Naval activities shall dispose of spent abrasive, dust, removed non-skid and solvents in accordance with Environmental and OPNAVINST 5090.1, **Natural Resources Protection Manual** and **NSTM Chapter 593, Pollution Control** . Private contractors shall dispose of waste in accordance with local, state, and federal laws.

634-3.27.4 WOOD OR GRP SURFACES. The environmental conditions addressed in paragraph 634-3.26 shall be met from the beginning of surface preparation until the surface being prepared has been completely painted. All data shall be recorded at least hourly to ensure that the aforementioned requirement is met.

634-3.27.4.1 Equipment which may be damaged during surface preparation shall be protected, including lights, catapult tracks, deck drains and water washdown systems. Deck drains shall be sealed with damage control plugs or other suitable equipment. Deck drains shall be tested following the completion of the non-skid installation to ensure that the drains are not clogged.

634-3.27.4.2 If old non-skid is being removed, surface preparation of wooden or GRP decks shall be performed by using a Tennant (scarifying) machine equipped with a spurring tool. When preparing the surface of wooden decks, the Tennant shall be run parallel with the direction of the wood's grain and any loose or rotted wood shall be removed. Once the old non-skid is removed, or if it is a new deck to be covered, the surface of the wood's or GRP surface shall be sanded lightly until it is bare. Any surface to be covered must be level and as smooth as possible; however, to maintain maximum thickness of wooden planks, do not sand all planks (or localized areas of planks) to the lowest sanded level. The underlayment (paragraph 634-3.30.7) will fill low spots to a uniform level.

NOTE

If any part of the deck is steel, paragraph 634-3.27.2 shall be consulted for preparation of steel decks.

NOTE

Naval activities shall dispose of dust and removed non-skid in accordance with Environmental and Natural Resources Protection Manual OPNAVINST 5090.1 and NSTM Chapter 593, Pollution Control. Private contractors shall dispose of waste in accordance with local, state and federal laws.

WARNING

Wear proper protective equipment during surface preparation (blasting, power tool cleaning), including appropriate eye, ear and respiratory protection. Safety officer shall be consulted.

634-3.27.4.3 Wooden deck planks shall be replaced for the following reasons:

a. Forward-aft cracks

b. Extensive splitting athwartship

c. Badly decayed deck

d. Deep grain separation (if grain were removed, it would bring plank below 2-1/2 inches thick)

e. Planks are less than 2-1/2 inches thick on a 4.2 pound plate

Only the affected portion of the plank, to the nearest longitudinal, shall be removed. Planks do not have to be replaced for localized type gouging or for poor surface appearance unless loss of structural strength is suspected.

634-3.27.5 SOLVENT WIPE. Dust, and grease or oil spots which remain after surfacing shall be removed with the solvent recommended by the non-skid manufacturer. After the solvent wipe has been performed, the area shall be permitted to dry for at least 2 hours at ambient conditions before applying any primer where solvent was utilized.

NOTE

If solvents are used, ensure that all local, state and federal VOC laws are observed.

NOTE

If compressed air is used to remove dust and dirt, ensure that the air is both oil and water free.

WARNING

The solvent manufacturer's material safety data sheet (MSDS) shall be consulted for safety and health precautions.

634-3.28 PRIMING METAL AND GRP SURFACES

634-3.28.1 PRIMER. An application of primer is normally required between the metal or GRP substrate and the non-skid topcoat. Primer not only improves adhesion of the non-skid topcoat, but enhances the total performance of the non-skid system. There may be Type I products on QPL-24667 that do not require the use of primer; with these products, the non-skid can be applied directly to the metal or GRP substrate.

NOTE

When applying Type I Composition L products on QPL-24667 in an aircraft carrier landing area, primer shall be applied so that the substrate is protected when the non-skid is damaged from impacts during landings.

634-3.28.2 QUALIFIED PRIMERS. The manufacturer's qualified military specification non-skid system shall be used. The use of Formula 150 (MIL-P-24441) primer is prohibited unless a non-skid system has been qualified with a particular manufacturer's Formula 150 as the primer. The qualified products list (QPL) of the specification being used shall be consulted to determine if a particular Formula 150 can be used as a primer.

634-3.28.3 STORAGE TEMPERATURE. As discussed in paragraph 634-3.26.2, the non-skid system's primer shall be stored within the temperature range listed in Table 634-3-4. However, if the long term storage temperature range specified in the manufacturer's ASTM F-718 sheets differs from this range, the manufacturer's guidelines shall be followed.

634-3.28.4 STORAGE PRIOR TO MIXING. The primer shall be stored between 70°F and 80°F for 24 hours prior to mixing.

634-3.28.5 ENVIRONMENTAL CONDITIONS. The environmental conditions addressed in paragraph 634-3.26 shall be met from the beginning of mixing until the application of primer has been completed. All data shall be recorded at least hourly to ensure that the aforementioned requirement is met.

634-3.28.6 EXPIRED SHELF LIFE. Primer which has a shelf-life that has been exceeded shall not be applied. Consult the manufacturer's product data sheet to determine the shelf life. The maximum shelf life of primer shall be one year from date of manufacture.

634-3.28.7 MIXING INSTRUCTIONS. Non-skid primer is usually shipped in 5 gallon kits.

1. If the primer is packaged as a two compartment container, open the primer container and remove the can of hardener. The plastic divider should then be removed. If the primer is not packaged in a double compartmented container, the can of hardener will be fastened to the can containing the resin.

NOTE

Ensure that the primer being used complies with all local, state, and federal VOC laws. Non-skid qualified products lists (QPL's) contain information concerning VOC compliance of non-skid system primers covered by military specifications.

WARNING

Consult the primer manufacturer's Material Safety Data Sheet (MSDS) for health and safety precautions.

2. Thoroughly mix the base material for 3 to 5 minutes with the type of mixer specified in the manufacturer's published guidelines. Make sure that all materials which may have settled during storage (pigments, fillers) are lifted from the bottom of the container and are uniformly mixed. Consult the manufacturer's product data sheets for mixing instructions.

3. Slowly pour the contents of the can of converter (hardener, accelerator or curing agent) into the base material. Scrape the bottom and sides of the converter can to ensure that the contents are completely transferred to the pail containing the base material. Mix the converter and base material for 3 to 5 minutes or until the mixed material assumes a uniform color and appearance. Scrape the bottom and sides of the pail to ensure complete mixing. Mix again for 3 to 5 minutes.

4. Thinning the primer is strictly prohibited.

5. Some primers require an induction period (stand time). Allow the mixed material to remain in the pail before use for the period of time (if any) specified for induction by the manufacturer. If the manufacturer's ASTM F-718 sheets specify that no induction time is needed, begin the application immediately after mixing.

6. Immediately after the induction period, stir again for one minute and start the application.

634-3.28.8 PRIMER APPLICATION INSTRUCTIONS. Protective plastic shoe coverings shall be worn to ensure that the substrate is not contaminated with oil, dirt or grease. Care shall be taken to ensure that the substrate is not contaminated by dirty clothing or hands.

634-3.28.8.1 Clean, new, white, lint-free rags, and the solvent specified in the manufacturer's ASTM F-718 sheets shall be used to remove any contaminants from the freshly blasted substrate before the application of primer proceeds. GRP surfaces need not be blasted. Clean contamination of GRP surfaces by wiping the surface with mineral spirits or a non-ozone-depleting solvent with clean white rags and allow surface to dry. Abrade the cleaned surface by sanding or grinding. Surface must be blown or brushed clean to remove any residue before application of primer.

NOTE

Cleaning a surface with detergents is prohibited since it can result in the deposition of solids from the detergent if the surface is not adequately rinsed. In addition, solids may be deposited from the rinse water upon evaporation since ″fresh water″ contains dissolved solids. Finally, when water comes into contact with an aluminum or steel substrate, the substrate will oxidize, requiring reblasting.

NOTE

If solvents are used, ensure that all local, state and federal VOC laws are observed.

WARNING

Consult the solvent manufacturer's Material Safety Data Sheet (MSDS) for health and safety precautions.

634-3.28.8.2 Equipment which is not to be primed shall be protected, including lights, catapult tracks, RAST tracks, deck drains and water washdown systems.

NOTE

Primer shall be applied to RAST tracks except for 1-inch strips on either side of the track opening and two 3 1/2 inch strips on the outboard edges of the tracks where the wheels of the RSD traverse. Do not coat the 3-inch square centered on the track bolts.

634-3.28.8.3 The primer may be applied by spraying or rolling. If the application method is spraying, whether airless or conventional air spray equipment is used, no thinner shall be added to the primer. Also, the manufacturer's ASTM F-718 sheets shall be consulted for spray data (pressures, hose sizes, nozzle sizes). Additional application may be necessary to achieve the DFT requirements. When applying primer with rollers, 3/4-inch nap rollers and paint can shall be used.

NOTE

Application of primer to areas which are difficult to access with spray equipment or rollers, such as the underside of aircraft securing fittings, may be accomplished by brushing.

NOTE

A dental mirror, or similar instrument, shall be used to ensure that the underside of aircraft securing fittings have been satisfactorily primed.

634-3.28.8.4 Wet film thickness (WFT) readings shall be taken throughout the application of primer to ensure that the required primer thickness is obtained. WFT readings shall fall within the range specified in the primer manufacturer's ASTM F-718 sheets. Procedures and equipment used to take WFT readings are discussed in paragraphs 634-3.34.5 and 634-3.34.6

634-3.28.8.5 The coating shall be visually inspected throughout the application to ensure that there are no holidays (bare spots).

634-3.28.9 PRIMER CURE The primer shall be allowed to cure until it is tack free. The ″Set-To-Touch Time″ procedure outlined in ASTM D-1640 may be used to determine if the coating is tack free. The tack free cure time of the primer usually ranges between 6 and 12 hours. Refer to the manufacturer's ASTM F-718 sheets for the cure time. If the application is performed in cool weather, the curing time will increase significantly. Conversely, if the application is performed in warm weather, the primer will cure faster.

634-3.28.9.1 Non-skid should be applied within 36 hours of primer application. When non-skid is applied within 36 hours of primer application, the area shall be inspected for contaminants (including moisture, dirt, oil, grease, etc.). If there are any contaminants present, clean the primer surface with the solvent specified in the non-skid manufacturer's ASTM F-718 sheets. Clean, white, lint-free rags shall be used. If moisture is present on the deck, the deck shall be dried with either compressed air (oil/water free), or with new, white, clean, lint-free rags. After drying, clean the deck with solvent using new, clean, white, lint-free rags. If there are any areas in which cracking, delamination, or spot rusting are occurring, repair the areas as specified in paragraph 634-3.32.

NOTE

Cleaning a surface with detergents is prohibited since it can result in the deposition of solids from the detergent if the surface is not adequately rinsed. In addition, solids may be deposited from the rinse water upon evaporation since ″fresh water″ contains dissolved solids.

634-3.28.9.2 If the application of non-skid occurs between 36 and 72 hours after primer application, the entire area shall be wiped with the solvent specified in the manufacturer's ASTM F-718 sheets using clean, white, lint-free rags. If there are any areas in which cracking, delamination, or spot rusting are occurring, repair the areas as specified in paragraph 634-3.32.

634-3.28.9.3 If non-skid is to be applied 3 to 7 days after the application of primer, the surface shall be wiped with the solvent recommended in the manufacturer's ASTM F-718 sheets using clean, white, lint-free rags. Afterwards, the surface shall be lightly sanded, or abraded and a tack coat of primer (1-2 mils WFT) shall be applied. Sanding ensures that the tack coat will adhere to the already installed primer. If there are any areas in which cracking, delamination, or spot rusting are occurring, repair the areas as specified in paragraph 634-3.32.

NOTE

If solvents are used, ensure that all local, state and federal VOC laws are observed.

WARNING

Consult the solvent and primer manufacturer's Material Safety Data Sheet (MSDS) for health and safety precautions.

634-3.28.9.4 If more than 7 days pass before the primer is topcoated, the area shall be reblasted to at least a near-white surface finish (see paragraph 634-3.27) and reprimed. At this point, the primer has reached full cure and will not bond with a topcoat.

634-3.28.10 PRIMER DRY FILM THICKNESS (DFT) Once the primer has cured, dry film thickness (DFT) readings shall be taken to ensure that the proper film build has been obtained. The following types of gauges may be used: magnetic pull-off (banana gauge), fixed probe magnetic gauge (Posi-Tector, Elcometer, etc.), and eddy current gauges (Posi-Tector, Elcometer, etc, for non-ferrous substrates). Ensure that the gauge has been calibrated in accordance with SSPC-PA2. For use of equipment, see paragraphs 634-3.34.6 and 634-3.34.7.

634-3.28.10.1 The following requirements are adapted from Steel Structures Painting Council's Paint Application Specification No. 2. Appendix B illustrates a sample calculation. Take five separate spot measurements spaced evenly over each 100 square foot area, as described below. The average of the five spot measurements shall not be outside the DFT range specified in the primer manufacturer's ASTM F-718 sheets. No single spot measurement shall be less than 80% of the specified thickness. Any one of the three readings which are averaged to produce each spot measurement may be out of the range by an amount greater than 20%. The readings shall be taken as follows:

1. If the total primed area does not exceed 300 square feet, each 100 square foot area shall be measured.
2. If the area is between 300 and 1000 square feet, three 100 square foot areas shall be randomly selected and measured.
3. If the area exceeds 1000 square feet, the first 1000 square feet shall be measured as required in subparagraph 2 above. For each 1000 square feet thereafter, one 100 square foot area shall be randomly selected and measured.

NOTE

If any 100 square foot area falls below the minimum DFT specified, take measurements in adjacent areas to determine the size of the area lacking primer.

634-3.28.10.2 The primer DFT shall fall within the range specified in the primer manufacturer's ASTM F-718 sheets.

1. If the primer DFT falls below the minimum specified, the surface shall be wiped with the solvent recommended in the manufacturer's ASTM F-718 sheets. Another primer coat shall be applied in accordance with procedures set in paragraph 634-3.28.8 and at a thickness which will allow the total primer DFT to fall within the limits set in paragraph 634-3.28.10.1.

NOTE

If solvents are used, ensure that all local, state, and federal VOC laws are observed.

WARNING

The solvent manufacturer's Material Safety Data Sheet (MSDS) shall be consulted for health and safety precautions.

2. If the primer thickness exceeds the maximum allowable primer DFT, the areas which violate the requirement

shall be blasted to at least a near-white metal surface (see Table 634-3-5 and Table 634-3-6) and primer shall be reapplied. All procedures shall be in accordance with guidelines delineated in paragraphs 634-3.27 and 634-3.29.

NOTE

Naval activities shall dispose of unused primer and primer containers in accordance with OPNAVINST 5090.1, **Environmental and Natural Resources Protection Manual** and **NSTM Chapter 593, Pollution Control** . Private contractors shall dispose of waste in accordance with local, state, and federal laws.

634-3.29 NON-SKID

634-3.29.1 GENERAL. Non-skid deck coverings are high performance, textured, organic materials which are applied to steel, aluminum, wood, and GRP to provide safe footing for personnel and to act as a slip-resistant surface for vehicles and aircraft. This section covers non-skid products that can be applied to steel and aluminum surfaces. For information concerning wood and GRP decks, see paragraph 634-3.27.4 and 634-3.30. Non-skid shall be dark deck gray in color in accordance with FED-STD-595 color chip number 36076, except VLS launchers, which will be haze gray, semi-gloss.

634-3.29.2 APPLICATION. Depending on the required profile and the type of product being used, non-skid can be applied by spraying, rolling or troweling.

634-3.29.3 STORAGE TEMPERATURE. As discussed in paragraph 634-3.26.2, the non-skid shall be stored within the temperature range listed in Table 634-3-4. However, if the long term storage temperature range specified in the manufacturer's ASTM F-718 sheets differs from this range, the manufacturer's guidelines shall be followed.

634-3.29.4 STORAGE PRIOR TO MIXING. The non-skid shall be stored between 70°F and 80°F for 24 hours prior to mixing.

634-3.29.5 ENVIRONMENTAL CONDITIONS. The environmental conditions addressed in paragraph 634-3.26 shall be met from the beginning of mixing until the application of non-skid has been completed. All data shall be recorded at least hourly to ensure that the aforementioned requirement is met.

634-3.29.6 MIXING INSTRUCTIONS Non-skid is usually shipped in 5 gallon kits. The following procedures apply:

1. If the non-skid is packaged as a two compartmented container, open the non-skid container and remove the can of converter. Remove the plastic divider. If the non-skid is not packaged as a double-compartmented container, the can of converter will be fastened to the can containing the resin and aggregrate.

NOTE

Ensure that the non-skid being applied complies with local, state, and federal VOC laws. Non-skid QPL's contain information concerning VOC compliance of non-skid materials covered by military specification.

WARNING

Consult the non-skid manufacturer's Material Safety Data Sheet (MSDS) for health and safety precautions.

2. Thoroughly mix the base material using the type of mixer specified in the manufacturer's ASTM F-718 sheets. Make sure that all materials which may have settled during storage (pigments, fillers, aggregate) are lifted from the bottom of the container and are uniformly mixed.

3. Slowly pour the contents of the can of converter (hardener, accelerator, or curing agent) into the base material. Scrape the bottom and sides of the converter can to ensure that the contents are completely transferred to the pail containing the base material. Mix the converter and base material for 3 to 5 minutes or until the mixed material assumes a uniform color and appearance. Scrape the bottom and sides of the pail to ensure complete mixing. Mix again for 3 to 5 minutes.

4. Thinning the non-skid is strictly prohibited.

5. Allow the mixed material to remain in the pail before use for the period of time, if any, specified for induction by the manufacturer. If the manufacturer's ASTM F-718 sheets specify that no induction time is needed, begin the application immediately after mixing.

6. Immediately after the induction period, stir again for one minute and start the application.

7. Non-skid which has a shelf life that has been exceeded shall not be applied. Consult the manufacturer's product data sheet to determine shelf life. The maximum shelf life of non-skid shall be one year from the date of manufacture. Where circumstances demand (i.e., where adequate quantities of material cannot be purchased in time to meet the production schedule), a usability test may be conducted to determine if the non-skid can be mixed and is suitable for application.

634-3.29.7 NON-SKID APPLICATION INSTRUCTIONS The following procedures apply:

1. Plastic shoe coverings shall be worn to ensure that the substrate or primer is not contaminated with oil, dirt or grease.

NOTE

There are MIL-PRF-24667 non-skid products which can be applied directly to bare metal (without primer).

2. Clean, new, white, lint-free rags, and the solvent specified in the manufacturer's ASTM F-718 sheets shall be used to remove any contaminants from the substrate if MIL-PRF-24667 Type I Composition G products are being applied directly to the substrate, or primer surface before the application of non-skid proceeds. Cleaning the deck with detergents before painting is prohibited, since the deposition of solids can result.

NOTE

If solvents are used, ensure that all local, state and federal VOC laws are observed.

WARNING

Consult the solvent manufacturer's Material Safety Data Sheet (MSDS) for health and safety precautions.

3. Equipment which is not to be covered by non-skid shall be protected, including pad-eyes, lights, catapult tracks, appropriate areas of RAST tracks, deck drains and water washdown systems.

NOTE

Nonskid shall be applied to RAST Tracks except for 1/2–inch strips on either side of track slot, and two 4 1/4–inch strips on the outboard edges of the track plates where wheels of RSD traverse. Do not apply non-skid over track plate securing belts, tape over 1–inch bolts with 2–3/8 inch squares.

4. Non-skid shall be applied to within approximately 2 inches of deck fittings and protrusions.
5. Non-skid shall be applied to within approximately 5 inches of deck coaming and deck edges.
6. Every effort should be made to apply non-skid in areas subject to vehicle traffic, aircraft movement, or in areas which may offer traction to mobile towing equipment. Areas underneath protrusions, such as stowage racks or firestations, that are normally found on hangar decks, or corner areas not subject to vehicle or aircraft movement, need not comply with the 6–inch rule for applying non-skid near deck edges.
7. Thinning of non-skid is strictly prohibited.
8. Non-skid shall not be applied over already existing non-skid.

NOTE

When non-skid is being applied, it may overlap existing non-skid slightly along the seam.

634-3.29.8 APPLICATION METHODS Refer to paragraph 634-3.29 for application methods and areas for various types of non-skid systems.

NOTE

Naval activities shall dispose of unused non-skid and non-skid containers in accordance with OPNAVINST 5090.1, **Environmental and Natural Resources Protection Manual** and **NSTM Chapter 593, Pollution Contol** . Private contractors shall dispose of waste in accordance with local, state, and federal laws.

634-3.29.9 ROLLING. The following procedures apply:

1. All products qualified as Types I, II, or III, of MIL-PRF-24667 may be applied by rolling.
2. The roller shall be a nine inch, smooth surface, hard phenolic core roller.
3. The non-skid surface shall show a pattern of peaks and valleys. The peaks shall be continuous, reasonably uniform and in the same direction (generally in forward-aft direction). Aggregate shall present a rough uniformly coarse appearance over the entire surface with no loosely adhered clumps of particles.

4. Non-skid is generally rolled in a fore/aft direction; however, welds parallel with the direction of the peaks and valleys of the non-skid shall be cross-rolled. Cross-rolling shall extend approximately 3 to 6 inches on each side of the weld. Welds 8 inches or less apart shall be treated as one weld.
5. Non-skid spread rates for rolled materials under MIL-PRF-24667 Types II or III shall be 25 to 35 square feet per gallon.
6. Non-skid spread rates for Type I materials under MIL-PRF-24667 applied by rolling shall be 20 to 30 square feet per gallon. These materials shall be applied to skid-configured helicopter landing zones. Type commanders shall specify locations for application of Type I materials, within the guidelines of Table 634-3-3, in areas other than skid-configured helicopter landing zones.

634-3.29.10 TROWELING. The following procedures apply:

1. Type commanders shall specify locations for troweled applications, as well as direction of troweling.
2. The manufacturer's recommendations on trowel size and spread rate shall be followed when applying conventional solids non-skid materials (Type II of MIL-PRF-24667).
3. If non-skid is to be applied to the landing area for skid-configured helicopters, Type I MIL-PRF-24667 materials shall be used and shall be applied by rolling (paragraph 634-3.29.9). Application of Type I MIL-PRF-24667 materials by troweling is prohibited.
4. When the 1/2–inch by 1/2–inch trowel is to be used, refer to Figure 634-3-10 for the 1/2–inch by 1/2–inch trowel configuration. Other size trowels shall have a configuration similar to the one shown in Figure 634-3-10.

634-3.29.11 SPRAYING. The following procedures apply:

1. Type IV non-skid materials qualified under MIL-PRF-24667 shall only be applied by spraying.
2. Whether airless or conventional air spray equipment is used, thinner shall be added to the non-skid per manufacturer's ASTM F-718 sheets.
3. The manufacturer's ASTM F-718 sheets shall be consulted for spray data (pressures, hose sizes, nozzle sizes).
4. The maximum non-skid spread rate for all sprayable materials under MIL-PRF-24667 shall be 60 square feet per gallon.
5. Non-skid shall not be applied by spraying to any flight deck.

634-3.29.11.1 Immediately after non-skid is applied in an area, the area shall be cordoned/roped off and appropriate signs shall be posted. 1MC announcements shall be made to preclude the possibility of pedestrian/vehicular traffic over the area.

634-3.29.12 CURE TIMES It is essential that the strength of the ridge formation be tested by probing with a dull putty knife, or similar tool, before allowing any traffic on newly applied coatings. If probing using moderate pressure results in penetration of the non-skid, neither foot nor vehicular traffic shall be permitted.

634-3.30.12.1 The strength of the ridge formation is dependent on the cure of the applied non-skid. The cure of the non-skid is a function of the surface temperature at the time of the application, and the ambient air temperature following the application. The surface temperature has a greater effect on the attained profile (the hotter the

surface, the thinner the coating; the colder the surface, the thicker the coating). Following the non-skid application, the ambient air temperature affects the time the total cure will be achieved. Normally, the higher the ambient temperature, the faster the total cure is reached. Conversely, the lower the ambient air temperature, the slower the non-skid will cure.

634-3.29.12.2 Consult manufacturer specification sheets, and ASTM F-718 sheets provided by the manufacturers for information concerning cure times. The following general guidelines can vary depending on temperature, humidity, and product:

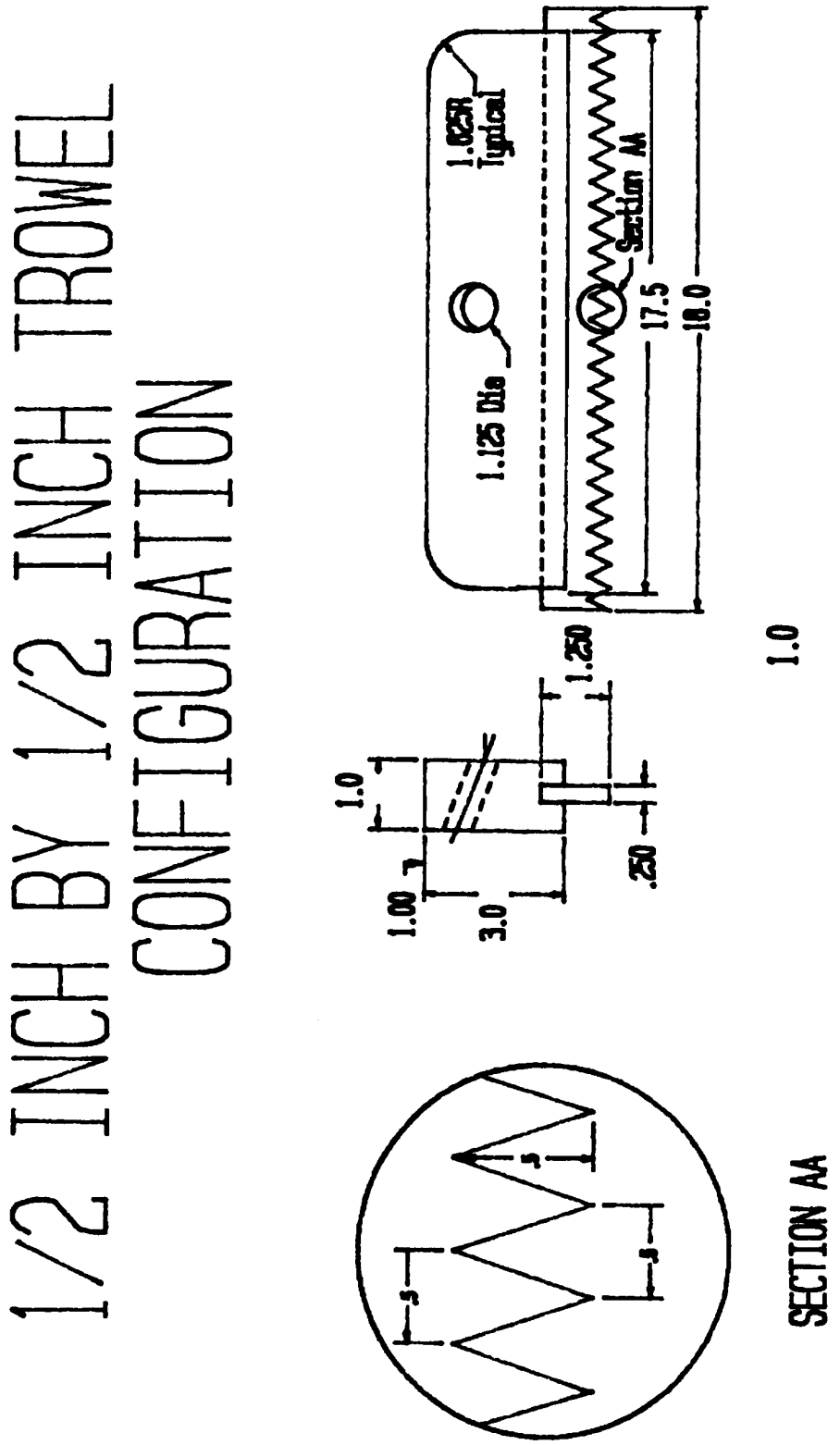


Figure 634-3-10. Trowel Configuration

a. Non-skid usually cures sufficiently for foot traffic 24 hours after application.

b. Non-skid can normally be exposed to vehicular traffic after 48 to 72 hours following application.

c. Non-skid should be fully cured after 7 days following application.

634-3.29.12.3 Arrangements shall be made to have non-skid repaired in accordance with the procedures outlined in paragraphs 634-3.32 as soon as there are indications the coating system is failing (delaminating non-skid, irregular wear patterns). If the failure occurs in the landing area, it shall be repaired as soon as possible since delaminating non-skid is a FOD hazard.

634-3.29.12.4 The non-skid coating shall be examined for, but not limited to, the following:

a. **Delaminations** . This failure mode occurs when the primer does not adhere to the substrate, or the non-skid does not adhere to the primer (see Figure 634-3-11). When MIL-PRF-24667 products are applied without primer, the failure will occur at the non-skid/substrate interface. The affected area shall be probed with a dull putty knife (or similar instrument), using moderate pressure, to determine the extent of the failure. The area shall be repaired as discussed in paragraph 634-3.32. Delaminating non-skid is a foreign object damage (FOD) hazard.

b. **Cross-rolling of welds** . When non-skid is applied by rolling, all welds that are not perpendicular to the direction of peaks and valleys of the non-skid shall be cross-rolled (cross-rolled non-skid is non-skid which is rolled in the direction perpendicular to a weld, see Figure 634-3-12). The cross-rolling shall extend approximately 3 to 6 inches on either side of the weld. Welds 8 or less inches apart shall be treated as one weld. If welds are not cross-rolled, delamination of the non-skid can occur since air can be trapped between the non-skid and primer. Non-skid, applied over welds, which has not been cross-rolled shall be corrected using the repair procedures specified in paragraph 634-3.32.

c. **Non-skid Profile Irregularities** . As shown in Figure 634-3-13, when non-skid is applied correctly by rolling and troweling, the peaks are reasonably uniform and in the same direction. The ridges of troweled non-skid shall be well defined, parallel and consistent. When non-skid is applied by rolling or spraying, the aggregate shall present a roughly uniform coarse appearance over the entire surface. An area where the non-skid peak profile is inconsistent and non-uniform is shown in Figure 634-3-14.

d. **Cracking** . Minor cracking is typical of non-skid coatings; however, cracks penetrating through the coating to the substrate, cracks in a spider web configuration and extensive cracking can be indicative of a serious problem. When this type of cracking is discovered, test the adhesion between the coating and the substrate with a knife. Insert the knife into cracks and attempt to pry the non-skid. Continue probing other cracks to determine the extent of the problem. Problem areas (i.e., areas where non-skid can be removed by prying in this manner) shall be repaired in accordance with the procedures delineated in paragraph 634-3.32. Cracking can be caused by an excessive amount of non-skid being applied.

e. **Discolorations** . Variations in the color of the non-skid need to be inspected. If the non-skid appears whitish in color (bleached), this suggests that moisture came into contact with the non-skid while it was curing. Although the non-skid may dry, it is possible that it will not cure. Test the adhesion of the affected non-skid by probing with a dull putty knife or similar instrument, using moderate pressure. Since orange-red discolorations may be an indication of rust bleed through, probe these areas in the same manner to test adhesion. If the non-skid system is tightly adhered to the substrate, the discoloration is probably caused by surface rust. When rusting equipment is left on the deck, the deck will become discolored (surface rust). If adhesion problems are evident upon probing, i.e., non-skid can be removed when probing with moderate pressure, continue probing to determine the extent of the problem. Areas with adhesion problems shall be repaired using the procedures

described in 634-3.32. Discoloration problems other than bleached non-skid may be improved by cleaning the non-skid in accordance with the procedures outlined in paragraph 634-3.33.

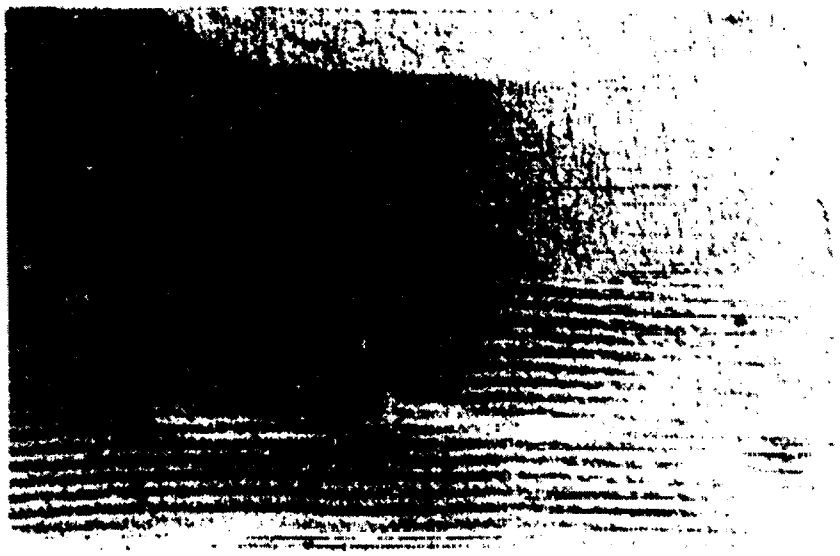
634-3.29.12.5 Non-skid shall be applied to within approximately 2 inches of deck fittings and protrusions (see Figure 634-3-15). Except for Type III coatings, the underlayment shall be installed 2–3 inches up on all bulkheads, coamings, pipes, and other vertical surfaces. For deck fittings, the underlayment shall be applied within 2 inches of the fitting, with a 1–inch border.

Poor surface preparation is usually the cause of paint failures, particularly delamination of paint. Above, non-skid has delaminated from the primer coat. The primer's surface was probably contaminated with dust, oil or moisture when the non-skid topcoat was applied. All surfaces must be free of contaminants before a coating can be applied.

Figure 634-3-11. Delamination Failure

All welds must be cross-rolled. The arrows in the above photo show that the non-skid has been properly cross-rolled along the weld. The cross-rolling extends approximately 3 to 6 inches on each side of the weld.

Figure 634-3-12. Cross-Rolling of Welds



When non-skid is applied properly, by rolling or troweling, the achieved profile is uniform and parallel. The top area of the above photo shows non-skid which has been applied by rolling. The lower area shows the non-skid profile that is obtained with the troweling method.

Figure 634-3-13. Non-Skid Application Methods

The arrows in the above photo show non-skid which has been applied incorrectly. The profile is inconsistent, and it appears that the non-skid has been "overworked." Non-skid is "overworked" when an applicator continuously pulls a roller over an area of freshly applied non-skid. When this occurs, the non-skid aggregate is not uniformly dispersed and a poor peak profile is obtained.

Figure 634-3-14. Non-skid Profile Irregularities

634-3.29.12.6 Non-skid shall be applied to within approximately 2 to 6 inches of deck coaming and deck edges.

634-3.29.12.7 Color topping (paragraph 634-3.31) shall be used only for safety and visual landing air (VLA) markings. Except when covering lines up to 6 inches in width which have been marked in an incorrect area, painting non-skid for cosmetic reasons is strictly prohibited.

634-3.30 MIL-PRF-244667, TYPE III DECK OVERLAY

634-3.30.1 GENERAL. Type III non-skid deck coverings (when used with an underlayment intermediate coat) are useful when a flexible coating is needed on a metal, GRP or wooden deck. It is also useful for uneven decks

when flatness is required. The manufacturer's ASTM F-718 sheet shall be used as a guide to install Type III non-skid systems. Where conflicts exist, such as application of color topping, **NSTM Chapter 634** guidelines shall be followed.

NOTE

Type III non-skid deck covering system products (primer, underlayment intermediate coat, caulking, non-skid, sealer, and color topping) shall be from the same manufacturer.

634-3.30.2 As discussed in paragraph 634-3.26.2, the non-skid system (primer, caulking, underlayment and non-skid) shall be stored within the temperature range listed in Table 634-3-4. However, if the long term storage temperature range specified in the manufacturer's ASTM F-718 sheets differs from this range, the manufacturer's guidelines shall be followed.

634-3.30.3 The non-skid system shall be stored between 70°F and 80°F for 24 hours prior to mixing.

634-3.30.4 The environmental conditions addressed in paragraph 634-3.26 shall be met from the beginning of mixing until the application of non-skid has been completed. All data shall be recorded at least hourly to ensure that the aforementioned requirement is met.

634-3.30.5 TYPE III PRIMER APPLICATION TO WOODEN DECKS. The following procedures apply:

1. When primer is being applied to wooden decks, the area to be worked shall be covered to provide shade. Shading is necessary because heat from the sun expands entrapped moisture or gases in old planks. Qualified primer, resilient underlayment in its gel state, lacks the strength to prevent blistering from moisture or gases being liberated.

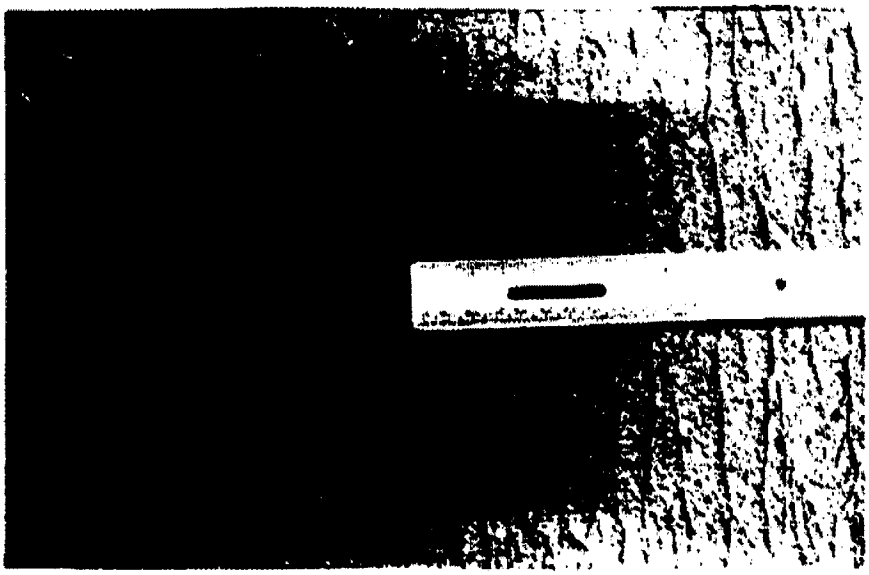
2. The deck shall be kept below 100°F at all times.

3. For wooden decks primer can be applied only if the surface moisture content is below 28%. This can be measured by probing the surface to 1/8–inch depth with a moisture detector. Various types of moisture detectors are manufactured by Delmhorst Instrument Company.

4. Primer shall be first applied to any area in which caulking is to be installed (see paragraph 634-3.30.6). Once the caulking cures, usually within 72 hours of application, all remaining areas shall be primed.

5. Do not apply primer which has a shelf-life that has been exceeded.

6. Mix the primer for wood and GRP surfaces in accordance with procedures delineated in paragraph 634–3.28.7.



A border, approximately 2 inches, shall be left between the edge of a deck fitting and the non-skid edge. (NOTE: It is not intended to have non-skid inspectors measuring this distance. The ruler in the above photo is for illustrative purposes only.)

Figure 634-3-15. Non-Skid Application Area

NOTE

Ensure that the primer being applied complies with local, state, and federal VOC laws.

WARNING

Consult the primer manufacturer's Material Safety Data Sheet (MSDS) for health and safety precautions.

7. After the mixing process is completed, the following procedures shall be followed during application of primer:
   a. Equipment which is not to be primed shall be protected including lights, catapult tracks, deck drains and water washdown systems.

NOTE

Primer shall be applied to RAST tracks except for one half-inch strips on either side of the track opening and two 3–1/2 inch strips on the outboard edges of the tracks where the wheels of the RSD traverse. Do not coat the 3-inch square centered on the track bolts.

b. The primer may be applied by spraying or rolling. If the application method is spraying, whether airless or conventional air spray equipment is used, no thinner shall be added to the primer. Also, the manufacturer's ASTM F-718 sheets shall be consulted for spray data (pressures, hose sizes, nozzle sizes). When applying primer with rollers, 1/4– to 1/2–inch nap rollers shall be used.

NOTE

Application of primer to areas which are difficult to access with spray equipment or rollers may be accomplished by brushing.

8. The primer shall be applied so that the dry film thickness obtained is in accordance with the manufacturer's ASTM F-718 sheets. Applicator shall use a wet film thickness gauge at frequent intervals to ensure that when the coating is cured it will be within the DFT range specified.

9. The primer shall be inspected throughout the application to ensure that there are no holidays (bare spots).

10. All metal and GRP surfaces shall be primed with Type III primer in accordance with procedures outlined in paragraph 634-3.28.

634-3.30.6 APPLICATION OF CAULKING. The following procedures apply:

1. The Type III primer shall be allowed to cure for 4 to 24 hours. If 24 hours is exceeded, a primer tack coat (1 to 2 mils wet film thickness) shall be applied. Procedures shall be in accordance with requirements outlined in paragraph 634–3.30.5.

2. All terminating boundaries (between tiedowns and planks, bounding bars and planks, landing lights and planks) should be routed to 1/2–inch wide by 3/4 —inch deep against the metal boundary. Oakum interference in seams shall be driven in. Prime seam sides with Type III primer prior to caulking.

3. Polyurethane caulking sealant shall be mixed in accordance with the manufacturer's written mixing instructions.

NOTE

Ensure that the caulking being applied complies with local, state, and federal VOC laws.

WARNING

The caulking manufacturer's Material Safety Data Sheet (MSDS) shall be consulted for health and safety precautions.

NOTE

Do not mix the components until ready to use. Do not vary mixing ratios, and mix only Parts A and B with the same control number.

4. Do not apply caulking which has a shelf-life that has been exceeded.

5. Polyurethane caulking sealant is normally available in either two or three-part compounds which are packaged in the proper proportions.

NOTE

Gray caulking is a two-part sealant and black caulking is a three-part sealant.

6. If three-part sealant is used, add Parts A and C to Part B; otherwise, add Part A to Part B. Mix thoroughly, with mixing equipment recommended by the manufacturer, until the sealant is a uniform color. The mixing time will range between 8 and 10 minutes.

NOTE

If all components are not mixed together thoroughly, the material will not cure.

7. Fill the joint with polyurethane caulking compound until the joint is level with the plank surface. Application shall be accomplished with a caulking gun or liquid pressure pump.

NOTE

It is important that the sealant be firmly pressed into the joint to ensure complete wetting of the bonding surface in order to obtain uniform adhesion.

634-3.30.7 APPLICATION OF TYPE III UNDERLAYMENT (INTERMEDIATE COAT) The following procedures apply:

1. Materials on the deck that are not compatible with Type III underlayment shall be removed. Caulking compound that is not adhered to the deck shall be removed.

2. Type III underlayment is packaged as Parts A and B. Only Parts A and B with the same control number shall be mixed.

NOTE

Ensure that the underlayment being applied complies with local, state, and federal VOC laws.

WARNING

The underlayment manufacturer's Material Safety Data Sheet (MSDS) shall be consulted for all health and safety precautions.

NOTE

Do not mix the components of Type III underlayment until ready to use.

3. Do not apply underlayment which has a shelf-life that has been exceeded.
4. Add Part A to Part B. Be sure to transfer as much of Part A as possible.
5. Mix Part A and Part B with type of mixer recommended by the manufacturer.

NOTE

Avoid mixing air into the material. This will result in entrapment of air bubbles in the coating.

6. Protect all areas which do not require the application of Type III underlayment. Apply compound conforming to MIL-I-3064, type HF, around or along terminating boundaries to form a dam so that Type III underlayment will not flow into undesired areas such as tiedown fittings. This will also permit proper film build of Type III underlayment.
7. Pour the mixed material onto the primed deck and smooth with rollers or notched trowels. The rollers shall be 9 inch short nap mohair rollers. The trowel configuration shall be as specified in the manufacturer's published technical bulletin.
8. Fill all voids. Roll material to a minimum thickness of 1/8 inch (approximate coverage is 12 square feet/gallon).
9. If a second coat of Type III underlayment is necessary, it shall be applied while the first coat is still tacky. If first layer is tack free, it must be heavily roughened by sanding to provide the proper anchor tooth for the second coat; otherwise, the second coat will delaminate.

NOTE

Do not apply primer over Type III underlayment.

10. Remove any masking tape as soon as the underlayment has gelled sufficiently not to flow.

634-3.30.8 APPLICATION OF TYPE III NON-SKID The following procedures apply:

1. Type III underlayment shall be allowed to cure enough to withstand foot traffic necessary for the application of non-skid Type III underlayment. Depending on humidity and temperature, the Type III non-skid can be applied to the underlayment within 16 to 24 hours.
2. Protective shoe coverings shall be worn to ensure that the underlayment is not contaminated with oil, dirt or grease.
3. If Type III underlayment is tack free, it must be wiped with the solvent recommended by the manufacturer.

NOTE

If solvents are used, ensure that all local, state, and federal VOC laws are observed.

WARNING

Consult the solvent manufacturer's Material Safety Data Sheet (MSDS) for health and safety precautions.

4. Transfer Parts A and B of Type III non-skid from their shipping containers to the mixing container. Non-skid shall be dark deck gray in color in accordance with FED-STD-595 color chip number 36076.

NOTE

Ensure that the non-skid being applied complies with local, state, and federal VOC laws.

WARNING

Consult the non-skid manufacturer's Material Safety Data Sheet (MSDS) for health and safety precautions.

5. Do not apply non-skid which has a shelf life that has been exceeded. Shelf life is one year from date of manufacture.
6. Mix the two parts for three to five minutes with the type of mixer recommended by the manufacturer. Total mixing time is approximately 10 minutes.

634-3.31.9 ADDITIONAL NON-SKID APPLICATION INFORMATION The following procedures apply:

1. Thinner shall not be added to the non-skid.
2. After the material has been mixed thoroughly, apply the non-skid by rolling or spraying.
3. When non-skid is applied by rolling, the roller shall be a nine inch, smooth surface, hard phenolic core roller. The spread rate shall be 25 to 35 square feet per gallon.
4. When non-skid is applied by spraying, the manufacturer's specification sheet shall be consulted for spray data (pressures, hose sizes, nozzle sizes). The spread rate shall be 40 to 50 square feet per gallon.

NOTE

Whether airless or conventional air spray equipment is used, thinner shall only be added to the non-skid per the manufacturer's ASTM F-718 sheets.

NOTE

Non-skid shall not be applied by spraying to any flight deck.

634-3.30.10 CURE TIMES. It is essential that a coating be tested before allowing traffic to cross over it. Primer and caulking can be tested by pressing your finger on the coating's surface. Only if the coating is tack free shall necessary foot traffic be permitted. When testing non-skid, the strength of the ridge formation shall be tested by

probing with a dull putty knife. If the non-skid peak profile is tack free, yet peaks can be removed with the knife when using moderate pressure, only essential foot traffic shall be permitted.

634-3.30.10.1 The hardness of a coating is dependent on the cure. Cure time is a function of the surface temperature at the time of application, and the ambient air temperature following the application. The surface temperature has a greater effect on the film build of a coating (the hotter the surface, the thinner the coating; the colder the surface, the thicker the coating). Following the coating application, the ambient air temperature affects the time the total cure will be achieved. Normally, the higher the ambient temperature, the faster the total cure is reached. Conversely, the lower the ambient air temperature, the slower the coating will cure.

634-3.30.10.2 Consult the manufacturer's published technical information for cure times.

NOTE

The manufacturer's cure times can vary depending on temperature and humidity.

634-3.30.11 INSPECTION OF TYPE III NON-SKID COATING. The non-skid shall be inspected for the defects described in paragraph 634-3.30.8. All repairs shall be done in accordance with procedures delineated in paragraphs 634-3.32.

634-3.31 COLOR TOPPING

634-3.31.1 GENERAL. Color topping is a functional coating, although it is often misused for aesthetic reasons. Continuous use of these coatings will compromise the slip-resistant properties of the non-skid. Therefore, caution shall be exercised when using any color topping, so that optimum slip resistance of the deck will be maintained. Color topping or sealers shall be used only for safety and visual landing aid (VLA) markings.

NOTE

Painting an entire deck or a section of a deck for cosmetic purposes is strictly prohibited. Additionally, the application of color topping to a flight deck for reasons other than VLA or safety markings is not permitted.

634-3.31.2 REQUIREMENTS. The location and color of required VLA markings can be found on applicable NAEC Class Guidance Drawings, Air Capable Ship Aviation Facilities Bulletin, Amphibious Assault Ship Aviation Facilities Bulletin, Shipboard Aviation Resume (NAEC-ENG-7576) or by contacting the local NAEC Field Office.

NOTE

All aircraft securing fittings shall be painted with a color topping. A dental mirror, or similar instrument, shall be used to ensure that the underside of these fittings have been satisfactorily painted.

634-3.31.3 APPROVAL. Color coatings are approved by NAVSEA only for VLA or safety markings on non-skid. Color toppings are listed on the appropriate non-skid QPL. The color toppings are approved for use only on non-skid made by the same manufacturer.

634-3.31.4 MANUFACTURER. Type III polyurethane sealer and color topping shall be of the same manufacturer as the Type III non-skid deck covering system.

634-3.31.5 RESTRICTIONS. Use of any non-approved paints or colored non-skid for lines, markings, or cosmetic purposes is strictly prohibited. Traffic paints formulated for use on air-fields and highways, alkyd paints and enamels, contain resins which do not bond well to non-skid coatings. Use of these paints will create slippery areas which may result in damage to aircraft and injury to personnel. Also, a foreign object damage (FOD) hazard may result since non-approved systems may delaminate.

634-3.31.6 STORAGE. As discussed in paragraph 634-3.31, the non-skid system's color topping shall be stored within the temperature range listed in Table 634-3-4. However, if the long term storage temperature range specified in the manufacturer's ASTM F-718 sheets differs from this range, the manufacturer's guidelines shall be followed.

634-3.31.7 TEMPERATURE. Color topping shall be stored between 70°F and 80°F for 24 hours prior to mixing.

634-3.31.8 ENVIRONMENTAL CONDITIONS. The environmental conditions addressed in paragraph 634-3.26 shall be met from the beginning of mixing until the application of primer has been completed. All data shall be recorded at least hourly to ensure that the aforementioned requirement is met.

634-3.31.9 COLOR TOPPINGS MIXING INSTRUCTIONS The following procedures apply:

1. Most color topping kits are shipped as a two-part system. First, mix the base material (and hardener, if pigmented) with the type of mixer specified in the manufacturer's published guidelines. Make sure that all materials which may have settled during storage (pigments, fillers) are lifted from the bottom of the container and are uniformly mixed.

NOTE

Ensure that the color topping being applied complies with local, state, and federal VOC laws.

If the color topping is a one-part system, mix it in accordance with the manufacturer's ASTM F-718 sheets.

WARNING

Consult the color topping manufacturer's Material Safety Data Sheet (MSDS) for health and safety precautions.

2. Slowly pour the contents of the can of converter (hardener, accelerator or curing agent) and the can of base

material into a mixing pail. Scrape the bottom and sides of both cans to ensure that their contents are completely transferred to the mixing pail. Mix the converter and base material for 3 to 5 minutes or until mixed material assumes a uniform color and appearance. Scrape the bottom and sides of pail to ensure complete mixing. Mix again for 3 to 5 minutes.

3. Thinning of the color topping shall be in accordance with manufacturer's ASTM F-718 sheets.

NOTE

If the color topping is thinned, ensure that local, state, and federal VOC laws are not violated.

4. Allow the mixed material to remain in the pail before use for the period of time (if any) specified for induction by the manufacturer. Immediately after the induction period, stir again for one minute and start the application. If the manufacturer's ASTM F-718 sheets specify that no induction time is needed, begin the application immediately after mixing.

634-3.31.10 COLOR TOPPING APPLICATION INSTRUCTIONS The following procedures apply:

1. Color topping may be applied to non-skid when the non-skid has cured sufficiently for foot traffic.
2. Color topping shall be applied by brushing, spraying or rolling. The manufacturer's specification sheet shall be consulted for spray data (pressures, hose sizes, nozzle sizes). When applying color topping with rollers, 3/4 to 1-inch nap rollers shall be used.
3. Color topping shall be applied at a maximum dry film thickness (DFT) of approximately 1.5 mils.
4. No more than three coats of color topping shall be used; however, if the loss of slip resistance is noticed with less than three coats applied, no additional coats shall be applied.
5. Lines up to 6 inches in width, marked in an incorrect area, may be color coated for hiding purposes. Markings greater than 6 inches in width shall be removed by the blasting or hand tool methods discussed in paragraph 634-3.27. Primer and non-skid shall be reapplied in accordance with procedures delineated in paragraph 634-3.29. If the non-skid is a polyurethane, the non-skid shall be removed to the underlayment and new non-skid applied (see paragraph 634-3.30).

634-3.32 REPAIRS

634-3.32.1 Repair of failure areas shall be accomplished since delaminating non-skid is a foreign object damage (FOD) hazard. Also, if the problem is not corrected, the failure can spread.

634-3.32.2 Failures can occur at the interface of the primer and substrate, primer and non-skid, or between the non-skid and substrate in the case of Type I MIL-PRF-24667 products being applied without primer.

634-3.32.3 When a failure is detected, the area shall be probed with a dull putty knife, or similar instrument, to determine how extensive the failure is. Once the failing area is located, the area to be repaired shall extend slightly (at least 3 inches) outside of the perimeter of the failing area to ensure that the problem is corrected.

634-3.32.4 Non-skid systems which consist of primer and non-skid, or just non-skid, shall be repaired as follows:

1. If the area which is failing is less than 50 square feet, power tools such as needle scalers, scaling hammers, sanders and grinders shall be used. The surface shall be prepared to a minimum cleanliness of SSPC-SP-11. Paragraph 634-3.27 delineate proper surface preparation procedures. Deck cleanliness ratings are defined in Table 634-3-5 and Table 634-3-6. Once surface preparation is completed, the area shall be primed (unless MIL-PRF-24667 Type I, Composition G non-skid is being applied without primer) and non-skid applied in accordance with the requirements of paragraph 634-3.28.
2. Areas which range in size between 50 and 500 square feet shall be resurfaced by using a Descobrader. A minimum deck cleanliness of SSPC-SP-11 (Table 634-3-3) shall be achieved. Non-skid and primer shall be applied in accordance with procedures outlined in paragraph 634-3.28.
3. Areas which are larger than 500 square feet shall be abrasively blasted. Abrasive blast equipment and procedures are discussed in paragraph 634-3.27. A minimum deck cleanliness of NACE 2 (Table 634-3-5) or SSPC-SP-10 (Table 634-3-6) shall be obtained. Non-skid and primer shall be reapplied as required by paragraph 634-3.28.

634-3.32.5 The non-skid system discussed in paragraphs 634-3.26 through 634-3.31 is comprised of a primer, underlayment (intermediate coat), and non-skid.

1. When failure of this type of system occurs at the primer/substrate or primer/underlayment interface, the area shall be repaired by removing the primer and underlayment until the wooden, GRP or metal deck is bare. The surface preparation procedures outlined in paragraph 634-3.27 shall be followed before reapplying the primer and underlayment (see paragraph 634-3.29).
2. If a failure exists between the non-skid and underlayment interface, the non-skid shall be removed to the surface of the underlayment. The underlayment's surface shall then be roughened by sanding, wiped with the solvent recommended by the manufacturer and non-skid shall be reapplied (see paragraph 634-3.30).

NOTE

If solvents are used, ensure that all local, state, and federal VOC laws are observed.

WARNING

The solvent manufacturer's Material Safety Data Sheet (MSDS) shall be consulted for health and safety precautions.

634-3.33 CLEANING

634-3.33.1 CLEANING THE SUBSTRATE OR PRIMER SURFACE. Poor surface preparation is the cause of 95% of the failures. Solvent cleaning is a procedure for removing foreign matter such as oil, grease, dirt, and other contaminants from surfaces by wiping or scrubbing the surface with rags. This ensures that no contamination is left behind to interfere with the adhesion of a coating.

1. Only clean, white, lint-free rags shall be used.

2. All solvents shall be compatible with the coating system being used. The solvent shall be referenced in the manufacturer's specification sheet.

3. When cleaning a surface, the solvent will become contaminated; therefore, fresh solvent shall be used frequently. The rags shall be turned and replaced often to avoid recontamination of the deck.

NOTE

If solvents are used, ensure that all local, state, and federal VOC laws are observed.

WARNING

The solvent manufacturer's Material Safety Data Sheet (MSDS) shall be consulted for health and safety precautions.

634-3.33.2 CLEANING NON-SKID Decks become contaminated with aircraft fuel, cable greases, hydraulic fluids, and lubricants. These contaminants contribute to fire and slip hazards for both personnel and aircraft. It is important that non-skid is kept clean, especially during deployment.

1. The cleaning compounds listed in Table 634-3-8 are approved for cleaning non-skid, including non-skid applied to flight decks.

2. The cleaners shall be mixed at a 20:1 dilution (seawater to cleaner). Use 1–1/2 inch or 2–1/2 inch commercial in-line inductors to ensure mixing of flight deck cleaner.

3. Flight deck scrubbers/high pressure washers or deck scrub brushes shall be used to scrub the areas being cleaned. After the scrubbing process is completed, the area shall be thoroughly rinsed with seawater.

WARNING

The cleaner manufacturer's Material Safety Data Sheet (MSDS) shall be consulted for health and safety procedures.

634-3.34 TEST AND MEASUREMENT PROCEDURES

634-3.34.1 DECK TEMPERATURE The deck temperature shall be measured to ensure that the non-skid system is being applied within the proper temperature range. If the deck temperature is too high or too low, the system's cure will be affected, possibly resulting in a failure.

Table 634-3-8. NON-SKID DECK CLEANERS

Company	Product	Cleaner NSN
DREW CHEMICAL CORP. 4565 PROGRESS ROAD BLDG. B, SUITE 3 NORFOLK, VA 23502 (804) 853-1161	EDGE	6850-01-376-1201 6850-01-376-1202
ALLIED ENTERPRISES 814 WEST 45TH STREET PO BOX 6159 NORFOLK, VA 23508-6159 (804) 489-8282	TASK FORCE	6850-01-376-1201 6850-01-376-1202
NOVAMAX 12801 NEWBURGH ROAD LIVONIA, MI 48150-1001 (313) 464-4555	CLEANER 888	6850-01-376-1201 6850-01-376-1202
B AND B TRITECH INC. 875 W. 20TH ST. HIALEAH, FL 33010-2310 (305) 888-5347	B AND B 88NA	6850-01-376-1201 6850-01-376-1202
ELSCO INTERNATIONAL 3407 E STREET SAN DIEGO, CA 92102 (619) 696-6609	SUPER BLAST OFF	7930-01-364-7375 7930-01-381-3353

1. The most common instruments used to measure deck temperature are surface thermometers (such as the rail thermometer shown in Figure 634-3-16).

2. Care shall be taken not to drop the surface thermometer since any shock will cause it to yield incorrect readings thereafter.

3. Place the surface thermometer on the deck.

4. Let the surface thermometer equilibrate for 3 to 5 minutes before taking a reading. When measuring the temperature of deck areas exposed to sun, shade the surface thermometer until the reading is taken. High wind can cause the rail thermometer to give erroneous readings.

634-3.34.2 SLING PSYCHROMETER

634-3.35.2.1 A sling psychrometer is used to measure wet and dry bulb temperatures. After obtaining these temperatures, the dew point and relative humidity can be determined. The instrument is shown in Figure 634-3-17.

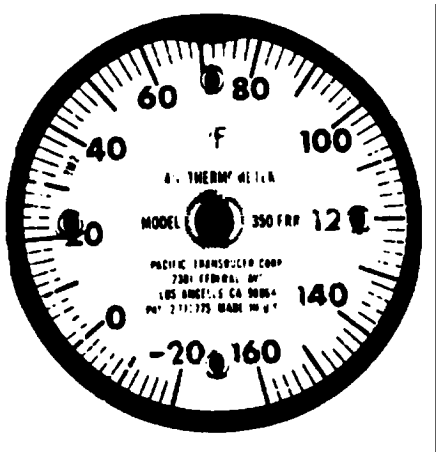
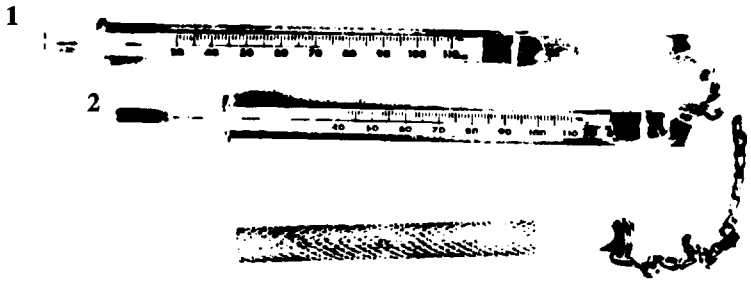


Figure 634-3-16. Rail Thermometer



1 WET Bulb

2 DRY Bulb

Figure 634-3-17. Sling Psychrometer

NOTE

Use spirit (non-mercury) thermometers or electronic devices to measure temperatures when installing non-skid on aluminum decks. Mercury in contact with aluminum causes severe cracking due to liquid metal embrittlement.

1. Wet the cotton wick attached to the wet bulb thermometer with clean tap water. If the cotton wick is dirty, discard and replace it.
2. Sling the psychrometer by the handle for 20 seconds. Read the dry and wet bulb temperatures.
3. Sling the psychrometer by the handle for another 20 seconds. Read the dry and wet bulb temperatures. If the readings are the same as previously taken, these are the actual dry and wet bulb temperatures. Otherwise, repeat the process until the same readings are obtained in two consecutive measurements.
4. Use the charts published by the National Weather Service or psychrometric charts to find the humidity and dew point. Appendix A illustrates a sample calculation.

634-3.34.3 PSYCHRO-DYNE A Psychro-Dyne can be used to obtain wet and dry bulb temperatures. It is similar to a sling psychrometer (paragraph 634-3.34.2); however, the Psychro-Dyne is stationary. The instrument is shown in Figure 634-3-17.

NOTE

Use spirit (non-mercury) thermometers or electronic devices to measure temperatures when installing non-skid on aluminum decks. Mercury in contact with aluminum causes severe cracking due to liquid metal embrittlement.

1. Make certain that the proper batteries are loaded.
2. Open the lid and wet the cotton wick of the wet bulb thermometer (Figure 634-3-19) with clean tap water. If the cotton wick is dirty, discard and replace it.
3. Close the lid. Place the Psychro-Dyne on the deck.
4. Turn the fan on by turning the dial located on the lid. Allow the thermometers to equilibrate for five to ten minutes before taking a reading.
5. Use the charts published by the National Weather Bureau or psychrometric charts (including the one printed on the lid of the instrument) to find the humidity and dew point. Appendix A illustrates a sample calculation.

634-3.34.4 TESTEX PRESS-O-FILM Measurement of deck profile is essential since more than 95% of coating failures result from poor surface preparation. The deck profile can be measured accurately by using mylar tape with a styrofoam backing (Testex PRESS-O-FILM) and a micrometer. The equipment is shown in Figure 634-3-20. Three types of Testex tape are available, Coarse (0.8 to 2.0 mils), X-Coarse (1.5 to 4.5 mils), and XX-Course (4.0 to 6.0 mils). The profile range that the tape is able to measure is printed on each piece of tape. The profile ranges of the two types of tape overlap. If the profile that is being measured is in this overlapping range. Use the type best suited to check the more critical, minimum or maximum, profile.

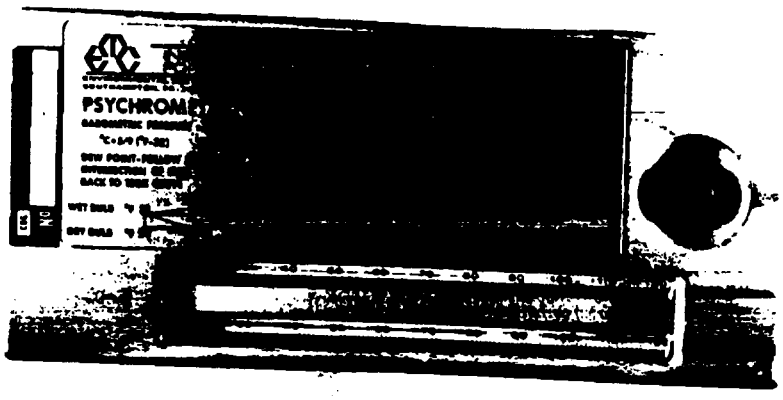


Figure 634-3-18. Psychro-Dyne

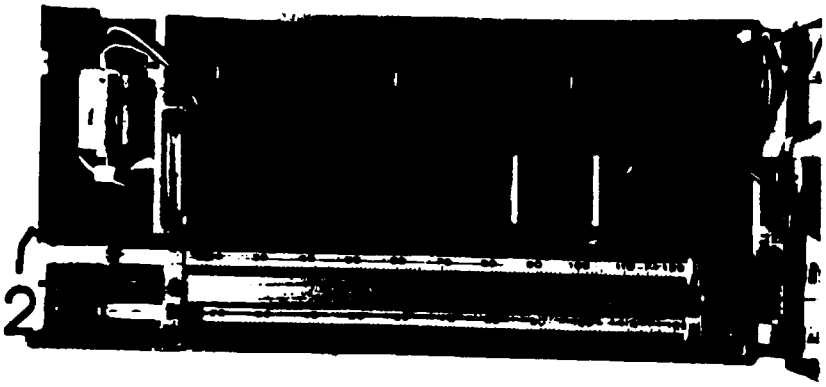


Figure 634-3-19. Wet and Dry Bulb Thermometers of the Psychro-Dyne

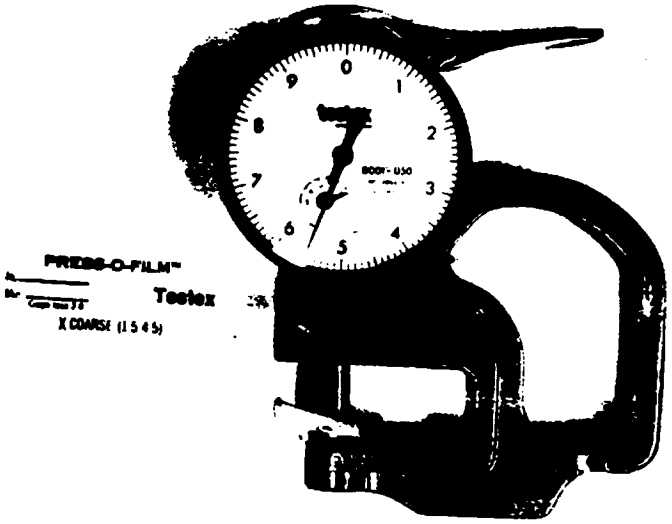


Figure 634-3-20. Testex PRESS-O-FILM and Micrometer

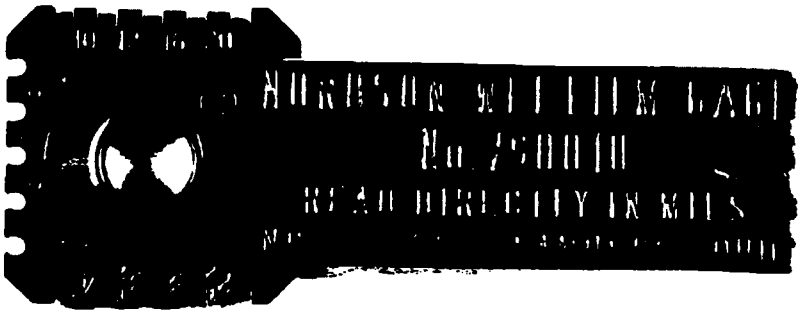


Figure 634-3-21. Wet Film Thickness Gauge

1. Ensure that the substrate is clean before taking a measurement.
2. Set the micrometer to eight.
3. Place a piece of Testex PRESS-O-FILM on the deck. Thoroughly rub the center circular window with a rounded object.
4. Remove the tape from the substrate.
5. Push the release lever, located at the top of the micrometer, down. While the lever is still down, place the tape between the measuring platens so that the circular window is centered. Slowly release the lever.
6. Read the surface profile directly from the scale.

634-3.34.5 WET FILM THICKNESS GAUGE. Wet film thickness (WFT) gauges are used to measure a paint's WFT to ensure that the proper film build will be achieved. Examples of WFT gauges are shown in Figure 634-3-21 and Figure 634-3-22.

1. Ensure that the WFT gauge is clean.
2. Choose the thickness range on the gauge that corresponds to the expected paint WFT range. Place the gauge firmly on the freshly applied paint.

NOTE

If the reading is not taken during the paint application, an incorrect reading will be obtained.

NOTE

The gauge must be level with the deck.

3. The reading is taken as the highest numbered tooth covered with paint. For example, if the teeth marked 1, 2, 3, and 4 are covered, but the 5 is not, the WFT is between 4 and 5.

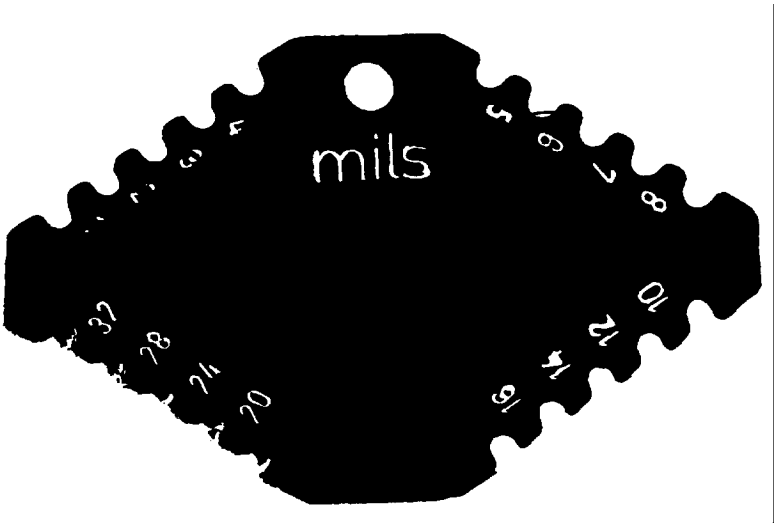


Figure 634-3-22. Wet Film Thickness Gauge

634-3.34.6 BANANA GAUGE The banana gauge, shown in Figure 634-3-23 is an instrument which measures the dry film thickness of primer (DFT).

1. Make certain that the gauge is calibrated, the tip is clean, and the primer has cured.
2. Chrome plated steel panels are available from the National Institute of Standards and Technology to calibrate the banana gauge. They range in thickness from 0.5 to 80 mils or more. The panels exceed the critical weight of steel needed to satisfy the magnetic field of the banana gauge.

NOTE

Plastic shims shall not be used to calibrate the banana gauge.

3. Measure the thickness of a series of calibration standards covering the expected paint thickness range. Turn the dial all the way counterclockwise. Then, slowly turn the dial clockwise until a ″click″ sound is heard. This is the reading. Record the calibration correction required at each calibration standard thickness.

NOTE

When large corrections are necessary, have the instrument rebuilt or replaced.

4. Measure the unprimed substrate in at least 5 spots to obtain a representative average value (Reading A).

NOTE

The gauge is not to be calibrated on the bare (unprimed) substrate.

NOTE

The gauge must be placed flush on the deck.

5. Measure the dry paint film (Reading B), at the number of spots specified in paragraph 634-3.28.10.
6. Subtract Reading A from Reading B to obtain the thickness of the paint film.

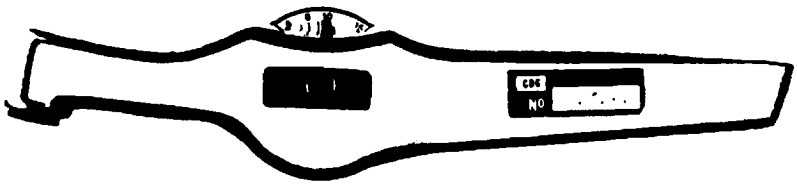


Figure 634-3-23. Banana Gauge

634-3.34.7 POSITECTOR 2000, 3000, AND 6000. The PosiTector 2000 and 3000 gauges are fixed probe gauges used to measure the dry film thickness (DFT) of paints. A PosiTector 2000, shown in Figure 634-3-24, is used when paint is applied over steel surfaces. A PosiTector 3000 (Figure 634-3-25) is used when paints are applied over aluminum substrates. PosiTector 6000, if properly equipped, can be used to measure both types of surfaces.

1. Ensure that the gauge is calibrated, the tip is clean and the primer has cured.
2. Plastic shims, provided with the instrument, shall be used to calibrate the gauge. Hold the gauge firmly so that the shim is tightly against the blasted metal surface (blast profile). Avoid excessive pressure as this might indent the plastic or cause the blast profile to be impressed on the shim's underside.

NOTE

The National Institute of Standards and Technology calibration standards shall not be used for fixed probe gauges unless recommended by the manufacturer. Use a minimum 3–inch x 3–inch x 1/8–inch plate with plastic shims.

3. Measure a shim, whose thickness is in the expected DFT range, over several areas of the bare deck. Readjust the gauge by moving the knob on the left side of the gauge.
4. When taking a reading, ensure that the tip is level with the surface. The DFT can be read directly from the gauge.

634-3.35 QUALITY ASSURANCE CHECKLIST

634-3.35.1 The Quality Assurance (QA) checklist provides a means for keeping a record of all data during the installation of non-skid. Data shall be recorded during surface preparation, primer application and application of non-skid following the instructions for completing the QA records in paragraphs 634-3.35.4 through 634-3.35.9. For Aircraft Carriers use latest applicable issue of COMNAVAIRLANT instruction 9630.1 and COMNAVAIR-PAC instruction 9634.1. When invoked in contract, NAVSEA Standard Item 009-32, **Cleaning and Painting Requirements** , shall be followed by all installing NAVSEA activities; i.e., NAVAL Shipyards, all SUPSHIP's, SIMA's, and DETACHMENTS.

634-3.35.2 Measurements are to be recorded throughout all phases of the installation at intervals of one or more measurements per hour and at the start and stop of each phase. A separate QA checklist should be completed and assembled for each area of installation. The QA checklist, Figure 634-3-26, is comprised of the following sections:

a. Surface Preparation

b. Primer Application

c. Non-skid Application

d. Color Topping Application

634-3.35.3 Initiate the checklist for each area where non-skid is being installed by filling in the ship name and hull number, the location of the installation, the non-skid application company or activity, and the square footage of the area.

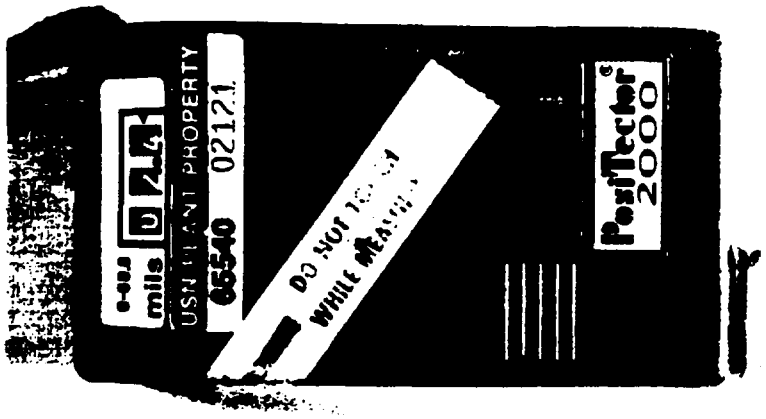


Figure 634-3-24. PosiTector 2000

Figure 634-3-25. PosiTector 3000

634-3.35.4 Completion of the Surface Preparation Section shall be as follows:

1. The inspector shall enter the date, his/her name, and the time.
2. Any pertinent comments before surface preparation proceeds, such as cleanliness of the deck, shall be listed as Pre-inspection Comments.
3. Enter the blasting method used (e.g.., vacuum blast, open blast) and the type and size of abrasive used (e.g., steel shot #660, #550, #440, #330) in the spaces provided. Enter the installing contractor or activity in the space provided.

4. At the start and completion of surface preparation, and at intervals of one hour minimum, record the following, then initial each line following entry of the readings:
   a. Time (on a 2400 clock)
   b. Air Temperature (° F)
   c. Wet Bulb Temperature (° F)
   d. Relative Humidity (%)
   e. Deck Temperature (° F)
   f. Dew Point (° F)
5. Once the surface preparation is completed, circle the deck cleanliness reading achieved following surface preparation. If the deck cleanliness was below the minimum required for non-skid application (worse than near white metal) state this in the comment section.

NOTE

Blast profile readings shall be recorded on page 2 of Figure 634-3-26. A diagram, indicating the location of the readings, shall be drawn.

6. Follow the steps below to calculate the average deck profile that is achieved in mils.
   a. Record the blast profile (surface profile) readings prior to the application of primer. Record the profile using TESTEX tape and a micrometer. This step should be achieved following cleanup of the deck.
   b. Take three profile readings per 100 sq ft for the first 500 sq ft blasted, then one reading per 1000 sq ft for the remainder of the area.
   c. Attach each tape used to page 2 to serve as a permanent record; use a sketch to show the location of each reading. Identify each reading with a number and write the surface profile measured in the spaces provided on the tape.
   d. Calculate the average and enter it on the bottom of page 2, and on page 1 under ″Deck profile average″.
7. Information pertinent to the surface preparation phase shall be entered under the comments (i.e., difficulties encountered during surface preparation, abnormal weather conditions).
8. Sign and date pages 1 and 2 in the spaces provided.

634-3.35.5 Completion of the Primer Application Section shall be as follows:

1. The inspector shall enter the date, his/her name and the time.
2. Any pertinent comments before primer application proceeds, such as cleanliness of the deck, shall be listed as Pre-inspection Comments.
3. Enter the number of hours the deck was left uncovered (the time between the start of surface preparation and the application of primer), indicate whether a brush blast of the area was accomplished (required if the deck was uncovered more than six hours), the primer manufacturer and product name, the primer batch number and storage temperature, induction time (if applicable), and record the Shelf-Life date of the primer.
4. At the start, completion, and at intervals of one hour minimum, record the following, then initial each line following entry of the readings:
   a. Time (on a 2400 clock)
   b. Air Temperature (° F)
   c. Wet Bulb Temperature (° F)

d. Relative Humidity (%)
e. Deck Temperature (° F)
f. Dew Point (° F)

5. Enter the induction time, if any, application method, and the average wet film thickness (WFT) obtained.

NOTE

Individual WFT readings shall be recorded on page 4 of Figure 634-3-26. Provide a sketch of the area showing the location of each reading. Calculate the average and enter it under the ″wet thickness average″ on page 3 and 4.

6. Circle the primer application method used: airless spray, conventional spray, or roll, and enter the wet film thickness average.
7. Sign and date pages 3 and 4 in the space provided.

634-3.35.6 Completion of the Non-Skid Application or Underlayment Section shall be completed as follows:

NOTE

If underlayment is being installed, use the same sheet that is used for non-skid. Make a notation on the sheet that data applies to the underlayment application.

1. The inspector shall enter the date, his/her name and the time.
2. Any pertinent comments before non-skid application shall be entered as Pre-inspection Comments.
3. Enter the average primer DFT, number of hours before non-skid was applied, the non-skid manufacturer and product name, the non-skid batch number and the temperature at which the non-skid was stored.

NOTE

Individual DFT readings shall be recorded on page 6 of Figure 634-3-26. A diagram, indicating the location of the readings, shall be drawn.

4. At the start, completion, and at intervals of one hour (minimum), record the following:
   a. Time (on a 2400 clock)
   b. Air Temperature (° F)
   c. Wet Bulb Temperature (° F)
   d. Relative Humidity (%)
   e. Dew Point (° F)
5. Enter the induction time (if any), application method, and the spread rate.
   a. Figure out gallons of non-skid used by multiplying the number of kits used by 5 gallons per kit bu 0.9 (Note — 0.9 is used to allow for product left in the cans and on rollers).
   b. Divide the area (in square feet) by the gallons of non-skid used.
6. Any information pertinent to the non-skid application phase shall be entered in the Comments Section.

634-3.35.7 Completion of the Color Topping Application Section, sheet 7 of Figure 634-3-26 shall be completed as follows:

1. Enter the date, name of inspector, and time in the space provided.

2. List any difficulties encountered or other related comments under ″comments″.

3. Enter the color topping manufacturer, product name, batch numbers used, storage temperature, and induction time (if applicable) in the spaces provided.

4. Record environmental conditions from the start of color topping mixing to the completion of color topping application, hourly as a minimum, in the spaces provided. Record the start time (when color topping was mixed) and finish time. Initial each line following the readings.

5. Circle the color topping application method used: airless spray, conventional spray, or roll.

6. List any comments from the application (e.g., number of cans used) or any difficulties encountered under ″comments″.

7. Sign and date in space provided.

634-3.35.8 The manufacturer’s ASTM F-718 sheets for the primer and non-skid shall be attached to the Quality Assurance Checklist. Diagrams and additional information shall be attached to the QA sheet, as necessary.

634-3.35.8.1 Application of non-skid to RAST track and side plates is depicted in Figure 634-3-27.

Ship Name and Hull Number _____

Location (including frame numbers) _____

Area (square feet) _____

Non-skid Applicator _____

SURFACE PREPARATION

Date _____, 19 _____

Inspector _____

Time _____

Pre-inspection Comments _____

_____

Blasting Method _____

Type/Size of Abrasive _____

Degreasing Method Used _____

Time	Air Temp	Wet Bulb	Relative Humidity	Deck Temp	Dew Point	Inspector
start						

stop

Deck Cleanliness: White Metal (SP-5), Near White Metal (SP-10)

Deck Profile Average (see page 2)

Bresle Patch Readings Average (see page 2)

Comments

Signature of Inspector

Date _____

Figure 634-3-26. Quality Assurance Checklist (1 of 7)

BLAST PROFILE READINGS
BRESLE PATCH READINGS (HYDROBLAST SURFACES)

Average Blast Profile = _____

Signature of Inspector _____

Date _____

Figure 634-3-26. Quality Assurance Checklist (2 of 7)

PRIMER APPLICATION

Date _____, 19 _____

Inspector _____

Time _____

Pre-inspection Comments _____

_____

Number of hours deck uncovered _____

Brush blast performed? Yes No

Primer Manufacturer _____

Product Name _____

Batch Number _____

Storage Temperature _____

Induction Time _____

Time	Air Temp	Wet Bulb	Relative Humidity	Deck Temp	Dew Point	Inspector
start						
stop						

Application Method: Airless Spray, Conventional Spray, Rolled

Wet Film Thickness (WFT) Average (see page 4) _____

Comments _____

_____

Signature of Inspector _____

Date _____

Figure 634-3-26. Quality Assurance Checklist (3 of 7)

WET FILM THICKNESS READINGS

Average Wet Film Thickness = _____

Signature of Inspector _____

Date _____

Figure 634-3-26. Quality Assurance Checklist (4 of 7)

NON-SKID APPLICATION

Date _____, 19 _____
Inspector _____
Time _____

Pre-inspection Comments _____
_____
Primer Dry Film Thickness (DFT) (page 6) _____
Number of hours before non-skid was applied _____

Non-skid Manufacturer _____
Product Name _____
Batch Number _____
Storage Temperature _____
Induction Time _____

Time	Air Temp	Wet Bulb	Relative Humidity	Deck Temp	Dew Point	Inspector
start						
stop						

Application Method: Rolled, Trowelled, Sprayed
Spread Rate (sq ft/gal) _____
Trowell size, if applicable _____
Comments _____
_____

Signature of Inspector _____
Date _____

Figure 634-3-26. Quality Assurance Checklist (5 of 7)

DRY FILM THICKNESS READINGS

Average Dry Film Thickness = _____

Signature of Inspector _____

Date _____

Figure 634-3-26. Quality Assurance Checklist (6 of 7)

COLOR TOPPING APPLICATION

Date _____, 19 _____

Inspector _____

Time _____

Pre-inspection Comments _____

_____

Color topping Manufacturer _____

Product Name _____

Batch Number _____

Storage Temperature _____

Induction Time _____

Time	Air Temp	Wet Bulb	Relative Humidity	Deck Temp	Dew Point	Inspector
start						
stop						

Application Method: Sprayed, Rolled, Brushed

Comments _____

_____

Signature of Inspector _____

Date _____

Figure 634-3-26. Quality Assurance Checklist (7 of 7)

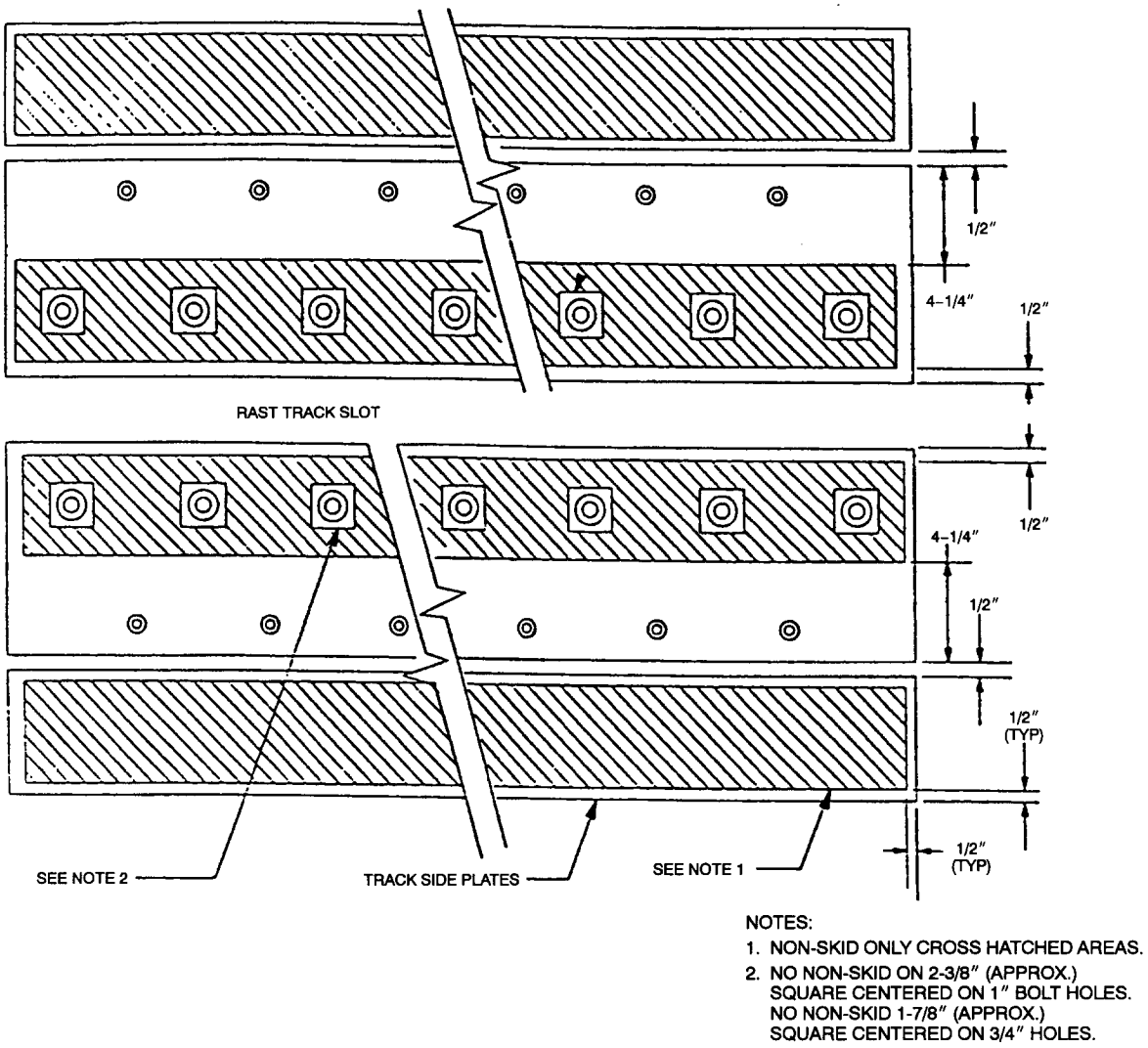


Figure 634-3-27. Non-skid of RAST Track and Side Plates

634-3.35.9 Mail copies of all completed checklists after the final acceptance of the non-skid installation to:

a. Commander
Naval Sea System Command
Attn: SEA 03M1
2531 Jefferson Davis HWY
Arlington, VA 22242-5160

634-3.36 MINIMUM NON-SKID FRICTION LEVELS

634-3.36.1 FRICTION LEVELS. Minimum friction levels, below which an unchocked aircraft could slide in severe sea and wind conditions, are provided in Table 634-3-9. Table 634-3-9 provides the friction qualities required as measured by a Findlay, Irvine Ltd. self-wetting GripTester. Slip-resistance GripTester values are not

the same values obtained from any other slip-resistance measuring device. Any significant area (i.e., more than 30 square feet) that falls below 0.84 for Type I and 0.74 for Types II, III and IV must be resurfaced.

634-3.36.2 PROCEDURE. To determine the minimum average GripTester friction reading the non-skid surface shall be divided equally in 3 foot intervals running fore and aft, covering the whole deck. The GripTester must be calibrated using the screw jack techniques which stress the measuring axle by defined amount in load and drag. The Findlay, Irvine Ltd. self-wetting GripTester shall be pushed at approximately 3 miles/hour with the measuring tire being self-wetted with tap water at an average low of approximately 1.2 gallons/minute. Friction readings are sampled eight times per foot. For each run, an average friction reading for each 3 foot length, and a grid showing the average friction readings for the area covered, shall be recorded.

634-3.37.3 EQUIPMENT. Findlay, Irvine Ltd. self-wetting Grip Tester can be purchased at:

AERO Group
POC: Mr. Bob Bunnell
P.O. Box 12213
Research Triangle Park
NC 27709
Tel: 1–800–672–8536
Fax: 1–919–544–9223

Table 634-3-9. MINIMUM WORN NON-SKID FRICTION LEVELS

TYPE I		
Average GripTester Reading	**Verbal Description of Deck Friction**	**Remarks**
0.91 & above	Good	Retest in 6 months
0.85 to 0.90	Fair	Retest in 3 months
0.84 & below	Poor	Replace non-skid
TYPE II, III and IV		
Average GripTester Reading	**Verbal Description of Deck Friction**	**Remarks**
0.86 & above	Good	Retest in 6 months
0.75 to 0.85	Fair	Retest in 3 months
0.74 & below	Poor	Replace non-skid

NOTE

Table 634-3-9 is based on minimum slipmeter limits currently specified in Performance Specification MIL-PRF-24667. Table 634-3-9 is also supported from test results on USS JOHN F. KENNEDY, grip tester manufacturer test reports, and ongoing technical research of similar non-skid products. NAVSEA will release NSWCCD-SSES non-skid slipmeter portable meter readings pending confirmation of the proposed non-skid portable slipmeter use limits.

SECTION 4.

DECK SEAM CAULKING INSTALLATION

634-4.1 CAULKING COMPOUNDS

634-4.2 OVERVIEW

634-4.2.1 SEVERAL KINDS OF CAULKING COMPOUNDS HAVE BEEN SPECIFIED

1. All of the following caulking compounds are approved for use depending on type of service. A general description of each compound is presented.
   a. Polysulfide base caulking compound, MIL-C-18255C, type I is a two-part polymer which cures to a resilient heat- and gasoline-resistant material. It was required on flight decks from which jet aircraft operate but has been superseded by Polyurethane Type MIL-S-24340. Polysulfide base caulking compound is under QPL-18255 and is available from standard stock system. To ensure compatibility, the primer should be of the same brand as the caulking compound. The National Stock Number (NSN) for 1 gallon of this caulking compound is 9Q-8030-00-682-6745. For metal surfaces, the manufacturer's recommended primer should be obtained.
   b. Marine glue MIL-G-413, class 2 is a low-cost, low-grade caulking compound which is neither heat- nor gasoline-resistant. Being a hot melt resin, it must be preheated and ladled. It is brittle at low temperatures and when old. It is used in conjunction with cotton and oakum caulking where specified. Marine glue MIL-G-413, class 2 is available from standard stock system, NSN 9Q-8030-00-174-259, 28-pound box.
   c. Metal and wood seam caulking compound Interim FED SPEC TT-C-1796 (GSA-FSS), (semi-drying oil type) is a material similar to common putty which skins over and remains soft inside. It may be obtained through standard stock system NSN 9Q-8030-00-550-8652, 5-gallon pail.
   d. Polyurethane caulking compound, MIL-S-24340, is a two-part liquid polymer which cures to a resilient heat and gasoline-resistant material. Apply according with supplier's directions.
2. Where to use:
   a. Polyurethane caulking compounds are approved for the following:
      (1) Flight decks of aircraft carriers (wood decks).
      (2) For repair of seams on ships which have rubber caulking, including wooden minesweepers.
      (3) For replacement of marine glue on ships where upgrading of the seam compound is considered necessary.
      (4) For repairs and new construction of small boat hulls and decks.
   b. Marine glue is to be used only as an emergency measure.
   c. Metal and wood seam caulking compound may be used on small boat decks or for repairs required on ships already having such material.

634-4.2.2 POLYURETHANE AND POLYSULFIDE CAULKING COMPOUNDS

634-4.2.2.1 General. To obtain good adhesion, caulking must be applied to clean, dry, primed surfaces. The compound should not be applied when the air temperature is over 38°C (100°F), and it will not cure below 10°C (50°F). Both caulking compound and primer must be of the same brand. The following equipment has been found to be satisfactory for applying polysulphide caulking compound:

a. Alemite Versatal Pump No. 318000 with air input of 25lb/in^2 and 275 lb/in^2 on outlet side, or low pressure barrel pump No. 7800 series, both as manufactured by the Alemite Division of the Stewart-Warner Company.

b. Graco Powerflo Mogul, 34- to-1 ratio pump, with powerflo extrusion outfit model No. 225-951, furnished complete with pump elevator, truck assembly, and 15 feet of 3/4-inch inside diameter hose and control valve for 5-gallon cans.

c. Graco Powerflo Mogul, 24-to-1-ratio pump, model No. 203-765 for 55-gallon drums, manufactured by Gray Company, Incorporated, Minneapolis, MN.

d. A paying nozzle made from 3/8-inch outside diametercopper tubing and tapered so that it may be easily

inserted in the deck seam, and a valve to control the flow of the compound, or Graco joint-sealer gun, model No. 203-815 complete with valve, 5-foot tube swivel outlet, and 1/4-inch nozzle, model number 203-815, for application from a standing position. For minor repair jobs, a hand caulking gun or an open pouring can with a lip to reach the bottom of the seam may be used.

e. Grooving Machine, NAVSEA dwg S9200-1298113, Revision 0.

634-4.2.2.2 Material. Caulking compound and primers should be procured on a job basis and not in excess of a 6-month supply.

1. Caulking compound, including required amount of separately packaged accelerator, fills approximately 50 feet of flight deck seam per gallon or about 225 cubic inches of cured material.
2. Primer covers about 250 feet of seam per gallon (spread rate based on two coats) and may be brushed or sprayed. Primer and caulking compound must be of the same brand.

634-4.2.2.3 Seam Preparation. For maximum adhesion, it is necessary that the part of the seam filled with caulking compound be dry and free of paint, marine glue, dirt, wood chips, white lead, rust preventive compound, or other oily substances. Only pentachlorophenol wood preservative (MIL-W-18142, type B) without water repellents is to be used. The preservative shall dry at least overnight to permit evaporation of the solvent before insertion of the caulking compound. For new installations, each plank should be outgaged as shown in the latest revision of NAVSEA standard drawing 805-921806. The grooving machine (see paragraph 634-4.2.2.1) is used to cut a seam 7/16-inch wide by 3/4-inch deep for repair jobs on decks which already have marine glue seams, where the planks remain in place, and the seams are to be repaired with rubber caulking compound. Marine glue shall be routed out completely and new wood must be exposed on both sides of seam. No caulking cotton or oakum is required. For repair jobs on planks which contain rubber caulking compound, the grooving machine is not necessary as the required outgage of the seam is already present. Rout out defective seams with a pneumatic reefing tool and scrape down to bare wood. Seams may be dried by placing canvas over the seam, forming a tunnel, and then blowing hot air through this tunnel using fuel oil or electric heaters.

634-4.2.2.4 Primers. Primers are furnished in one- or two-part compounds. Special primers are required depending on whether surfaces are wood, steel, or aluminum. When two-part primers are used, the entire contents of a unit should be used if possible. Mix the materials according to the manufacturer's instructions. Mixed primer should be used as soon as possible. Apply primer as in manufacturer's directions assuring that no holidays are left when priming. See manufacturer's instructions for minimum and maximum primer curing time required before application of caulking seam compound. It is of utmost importance for good adhesion of caulking compound that the wood be dry, clean, and properly primed.

634-4.2.2.5 Preparation Of Rubber Caulking Compound (Polysulfide). The caulking compound is generally furnished in two parts, the base and the accelerator, which usually is of a paste consistency. It is packaged with the required amount of compound and accelerator. If other than full containers are used, the ratio should be that specified in manufacturer's instructions. The compound will set up too fast if too much accelerator is added. If too little is added, the compound will not cure sufficiently.

1. The accelerator portion must be mixed into a smooth paste. Do not pour off the liquid portion. Slowly stir thoroughly mixed accelerator into the compound in a slow-speed power-driven mixing chamber, or by hand. As little air as possible should be beaten into the batch. Mix the accelerator and caulking compound slowly (60 rpm) and thoroughly for a minimum of 15 minutes before applying to primed seam. Ensure that no specks

of accelerator can be seen. Pour the mixed material into the pump tank and scrape sides of mixing chamber to assure maximum removal of material from the mixer.

2. Low temperatures and low humidity will increase the curing time; higher temperatures and humidity will reduce the curing time. Do not mix the compound with the accelerator unless it is to be applied directly after completion of the mixing operation.
3. Schedule the mixing operation so that the pump does not become empty, trapping air in the feed line. It is recommended that additional mixed compound be added when the level in applicator tank drops to approximately 6 inches. No solvent should be added to either the accelerator or compound.

634-4.2.2.6 Application. After the seams have been primed, the prepared compound is placed in the material container of the pump. The rate of flow of the compound should be adjusted with the hand valve to a steady, even flow. The compound is forced into the seam by inserting the paying nozzle at the bottom of the seam so that the compound flows from the bottom to the top thereby preventing air from being trapped in the bottom, and ensuring a completely filled seam. Any voids or bubbles which can be seen should be broken and filled with additional material as required. During warm weather with temperatures above 70°F, the compound is initially less viscous and takes less air pressure. It becomes progressively more viscous shortly after mixing due to partial curing; hence, the rate of flow should be maintained by increasing the air pressure on the pump. If the material thickens too quickly at temperatures above 70°F, flush the pump hose and paying nozzle with toluene, xylene, or methyl ethyl ketone after paying out each batch of compound to prevent clogging. For minor repair jobs, small capacity pressure equipment, an improvised pouring can with a lip sufficiently long to reach the bottom of the seam, or a hand-caulking gun may be used to apply the compound. Planks should be installed and the seams caulked and payed the same day to prevent the seams from becoming wet or dirty. The areas that have been caulked should be roped off or covered with temporary wood sheathing to prevent the compound from being tracked over the deck. The compound usually will cure overnight to a stage where foot traffic will not damage it. After 96 hours, the compound is cured and, if an excess is present, seams may be trimmed flush with the planks by means of a sharp edged tool.

1. The caulking equipment must be flushed thoroughly with toluene, xylene, or methyl ethyl ketone at the end of each working period; otherwise, the remaining compound will harden and clog the equipment. Upon completion of the job, or at any time when the flow of the compound is very low even under a full line pressure, the equipment must be flushed thoroughly with solvent, the pump and all fittings disassembled, and the compound completely removed.

634-4.2.2.7 Safety Precautions. Adequate fire and safety precautions must be taken with solvents and primers as they are flammable and constitute a health hazard if used in confined spaces without adequate ventilation. Hygienic precautions for lead peroxide apply for handling the accelerator and mixed compound to prevent mouth and skin contact. Water soluble hand cream shall be applied before handling.

634-4.2.3 MARINE GLUE

634-4.2.3.1 General. Marine glue should conform to MIL-G-413, class 2. It is to be used as supplied by the manufacturer.

1. The glue should be melted slowly using electrically heated, thermostatically controlled, insulated glue pots which will hold the heat and distribute it evenly. Heat to approximately 300°F to 350°F depending upon the properties of the particular marine glue, or until it becomes entirely fluid, stirring frequently. It should never be heated to the boiling point as brittleness will result from overheating or boiling. When properly melted and

ready for use, the glue should drip like oil without stringing out. It should be used as promptly as possible in this consistency. If allowed to cool, it will thicken, not run freely into the seams, and tend to form air pockets or bubbles. Only sufficient glue for immediate use should be melted. As it is taken from the melting pot, additional quantities should be added to meet further requirements. The melting pot should be cleaned after each run and any remaining glue discarded. The glue pots should be kept as close to the job as possible, usually on the deck of the ship. When the glue pot is stationed off the deck to be caulked, the heated glue is carried to the area of use in a covered bucket, transferred to a small paying ladle, and applied as rapidly as practical. Glue which appears to be congealing should be returned to the bucket or glue pot and another hot portion taken.

2. For small jobs, where the glue is received in friction-top cans, the opened cans first should be heated on the sides to soften the material, permit expansion, and allow gas to escape before placing the can directly over the heat. An electrically heated ladle in which the glue is heated to 300°F and maintained at that temperature during application, also may be used.

3. Although overheating of the glue may cause defects or impairment, underheating may result in imperfect adhesion in the seam and, therefore, fail to give the requisite water-tightness. During cold weather, when the cooling rate of marine glue is very rapid, a shorter carry must be employed, and the glue must be payed into seams more rapidly. Care must be exercised to keep the carrying bucket covered.

634-4.2.3.2 Seam Repairs. Old seams which have no underlayment beneath the planking shall be cleaned thoroughly of all traces of pitch, putty, and resin by scraping to bare wood. Cotton and oakum shall be reeled out if necessary and one thread of cotton, MIL-C-269. type I, class 2, and two threads of oakum. T-0-56, shall be placed in the seam, leaving a space above the caulking for marine glue to attach securely to the sides of the seam. For decks which have underlayment, the seams shall be cleaned as above and repayed. No cotton or oakum shall be used.

a. **New Seams** . New planking shall be installed over synthetic rubber underlayment (see paragraph 634-5.2). The seams shall be payed full depth using two passes. No cotton or oakum shall be used.

b. **Applying the Glue** . Special care should be taken to keep the seams absolutely dry as the slightest moisture under the marine glue will impair its effectiveness. The glue should be applied on a clear day or under cover.

   1. The glue should be poured into the seams from a paying shell or ladle with a spout designed to issue a fine stream. The spout should be held sufficiently above or away from the seam to allow the air to escape by the addition of a guiding skeg or crossbar. The spout should not be drawn in the seams as this permits air to be enveloped which cannot escape before the glue sets and the resultant air pockets leave the seams hollow and unsound.

   2. It is preferable to apply the glue in two operations, the first filling to consist of a small quantity payed into the bottom of the seam and allowed to set before applying the second one.

   3. It is advisable to allow the glue to overflow the seams slightly, permitting the excess to remain for several days. This allows for gradual settlement of the glue into place. Scrape on the excess flush with the deck, scraping diagonally across the seam. In hot weather, when the glue is soft, application of water to the deck will facilitate scraping.

   4. Frothing or, especially, air bubbles, should be guarded against in paying seams, as they will impair the evenness of the filling and the water-tightness of the seams. Air bubbles may be due to:

      (a) Too high a temperature of the glue.

      (b) An excess of oil in the oakum or deposited in the seams by the caulking tools.

      (c) Wet weather or presence of water in the seams.

      (d) The presence of sulfa or similar chemicals in the oakum.

(e) Spout not held above the seam.

634-4.3 FLIGHT DECK ALUMINUM LANDING INSERT SEAM

634-4.3.1 MATERIAL. The following procedure applies to replacement of bonding seam around the periphery of the aluminum landing insert. Materials are given as follows:

a. **Epoxy resin** . Ciba Araldite #6005, or Bakelite ERL 2772.

b. **Epoxy hardeners** . Triethylene tetramine (Teta). Ciba #951, or Bakelite ZZ-L-0840.

c. **Thickening agent** . J. Cabot Co. Cab-O-Sil

d. **Silicone caulking compound** . DOW RTV 112

e. **Primer** . General Electric Silicone Primer SS-4004

f. **Unicellular polyvinylchloride foam** . US Rubber Ensolite, Type M

g. **Seam Compound** . MIL-C-18255 or proprietary compounds where specified

634-4.3.2 INSTALLATION PROCEDURE. The existing seam compound and any oakum or cotton should be removed from the four sides of the aluminum insert. Mechanically clean out most of the material adhering to seam and use an acetylene torch to char remaining rubber caulking compound. Follow with sandblasting to full depth.

1. Fill bottom 3/4–inch of entire seam with epoxy compound when the aluminum is cool. The epoxy compound consists of a mixture of 100 parts by weight (P/W) of epoxy resin and 13 P/W of hardener. Cab-O-Sil may be added to the mixture to make it thick and more suitable for use on vertical surfaces to seal between plank ends where welding is not possible.
2. After the epoxy cures in the base of the seam, the sides should be sandblasted lightly to remove contaminants such as products of oxidation.
3. Brush or spray primer coat of SS-4004 and allow to dry half hour before paying 1/2–inch of RTV 112 self-leveling silicone rubber compound into the seam.
4. Install polyvinylchloride foam strips (1–inch by width of seam plus 1/8–inch), which have been dip-coated with silicone rubber RTV 112.
5. Allow silicone rubber around foam to partially cure (2 to 3 hours), then pay a final pass of rubber caulking compound, MIL-C-18255, using proper primer for aluminum and steel as required. The center of the seam should be about 1/4–inch below the deck with the edges rounded up to deck height.

SECTION 5.

WOOD DECK REPAIRS

634-5.1 INSTALLATION OF WOOD PLANKING OVER STEEL PLATING

634-5.1.1 The following measures are approved to upgrade and leakproof existing wood flight decks when repairs are to be made or on new installations:

1. Embed new wood planking in polyurethane underlay compound (see paragraph 634-5.3). Materials and installation shall be as specified herein. This involves omission of formerly used thick-film rust-preventive compound beneath the planks, and the cotton and oakum in the seams.
2. Weld studs directly to longitudinals of 10.2 pounds and heavier plate. Where attachment to plate lighter than 10 pounds is unavoidable, a 5-pound steel pad shall be welded beneath the stud.
3. Polyurethane caulking compound shall be utilized in seams on carriers.
4. Other repairs specified include:
   a. Gunning compounds for treating existing leaks without removal of planking.
   b. Underlayment for jet warmup area.

634-5.2 SYNTHETIC RUBBER UNDERLAYMENT

634-5.2.1 GENERAL. Synthetic rubber underlayment is a liquid polymer with lightweight aggregate. When applied over the steel plating of decks on which wood planking is placed, this material seals the deck and acts as a fairing to fill all spaces due to the irregularities of the steel deck.

634-5.2.2 STEEL SUBDECK CLEANING. Remove all oil, underlayment, and rust preventive grease; sandblast to bare steel. Primer shall be applied within 4 hours of the sandblasting.

634-5.2.3 MATERIAL. Primer shall be of same brand as underlayment compound and as specified for steel by manufacturer. Rubber underlayment shall be formulated:

1. MIL-C-18255, type I, Polysulfide; 100 P/ W.
2. Phenolic microballoons, Bakelite Corp. No. BJO-09030; 10 P/W.

634-5.2.4 PRIMER APPLICATION. Primers are furnished in either one- or two-part compounds. Special primers are required for steel and aluminum. When using two-part materials, the entire contents of a unit should be used if possible. Mix the materials as specified in the manufacturer's directions. Mixed primer should be used as soon as possible. Apply primer as specified in manufacturer's directions ensuring that no holidays are left when priming. It is of utmost importance for good adhesion of underlayment compound that the deck be dry, clean, and properly primed. See manufacturer's instructions for minimum and maximum primer curing time required before application of seam compound.

634-5.2.5 UNDERLAYMENT COMPOUND PREPARATION. Polysulfide rubber compound is furnished in two parts, the base and the accelerator, which is of a paste consistency. It is packaged with the required amount of compound and accelerator. If other than full containers are used, the ratio should be that specified in the manufacturer's instructions. The compound will set up too fast if too much accelerator is added; if too little is added, the compound will not cure sufficiently.

1. The accelerator portion should be mixed into a smooth paste. Do not pour off the liquid portion. Slowly stir the thoroughly mixed accelerator into the compound in a slow-speed power-driven mixing chamber, or by hand. As little air as possible should be beaten into the batch. Mix the accelerator and base compound slowly (60 rpm) and thoroughly for a minimum of 10 minutes before adding microballoons. Make sure that no specks of accelerator can be seen. Add microballoons up to 10 percent by weight to suit consistency desired and continue to mix for 5 minutes.

2. It should be noted that low temperatures and low humidity will increase the curing time, higher temperatures and humidity will reduce the curing time. Do not mix the compound with accelerator unless it is to be applied directly after completion of the mixing operation. No solvent should be added to either the accelerator or compound.

634-5.2.6 LAY-DOWN. The rubber underlay shall be poured, troweled, or broomed in place to the minimum depth which will fair the deck so that all voids under the planks are filled. The use of shims should be restricted to not more than 1 inch by 6 inches and only directly over a longitudinal. The amount of underlay which is not covered with planks shall be held to a minimum. The planks should be laid in place successively into the uncured underlay, tamped down well and secured with deck nuts, starting at the closed end and proceeding toward the open end. This forces any excess underlay ahead of each plank and completely fills all voids and the greater percentage of each seam. Cotton or oakum shall not be used in seams of planking installed over rubber underlay. Seams should be caulked as soon as the underlay is cured, using correct material as stated earlier in Section 4.

634-5.3 GUNNING COMPOUNDS

634-5.3.1 The gunning-compound system for treating leaks is considered a temporary economy measure and should be utilized only when it is not practical to remove planking. Re-treatment should be expected. Due to the presence of the rust preventive compound under the wood planks, except in localized areas, a permanent seal would not be expected.

1. For each leak reported, a number of holes (5 to 12) are drilled radially through the wood decking from a central hole. A screw fitting is fastened in place and a high pressure lubricant gun and pump are used to inject sufficient compound to seal an individual leak. It usually is possible to cover approximately 10 square feet from one hole. The outlying periphery of holes will indicate the extent of flow of the compound. The holes are then sealed with a wood plug or caulking compound. Test area with water hose to determine if leaks still exist.
2. Underlayment (paragraph 634-5.3) having 3 to 5 percent by weight microballoons shall be used as the gunning compound.

634-5.4 UNDERLAYMENT FOR JET WARMUP AREA COOLING PANELS

634-5.4.1 GENERAL. The following procedure applies to installation of aluminum cooling panels in wood flight decks. The space between the panel and the steel deck pan shall be filled with special heat-resistant underlay specified as follows: Trowel approximately 2 inches of magnesium-oxychloride-resorcinol underlay over the steel subdeck, then embed the cooling panel which has been covered on the back with a layer of silicone rubber compound into the mastic. The following materials are required:

a. Solvent. Xylene or trichloroethane for cleaning metal surfaces.
b. Silicone rubber adhesive compound and primer for corrosion barrier on aluminum. The following products are acceptable.
    1. Adhesive - RTV 732 or RTV 112.
    2. Primer for Aluminum - 1200 primer, Dow Corning Company, or SS-44004, General Electric Company.
c. Latex mastic MIL-D-3135 for steel surface wetting coat, formulated as follows:
    1. One P/W rubber latex, 9Q-5610-00-141-7958.

2. 2-1/2 P/W underlay powder 9Q-5610-00-141-7959 (without aggregate)

d. Coverage of 1 gallon of mixed adhesive is about 50 square feet.

e. Number 13 gauge expanded metal 9Q-5680-00-222-4005

f. Magnesium-oxychloride-resorcinol mastic for underlay (Table 634-5-1)

634-5.4.2 PANEL PRETREATMENT. Panel pretreatment is accomplished by coating bottom face of cooling panel with a barrier to eliminate possible corrosion from contact against the magnesium-oxychloride cement underlay as follows:

1. Solvent wipe to clean metal-xylene or trichloroethane.
2. One brush coat primer (paragraph 634-5.4.1, step b).
3. Allow at least 30 minutes drying time.
4. Apply 10 to 15 mil coat of silicone rubber adhesive (paragraph 634-5.4.1, step b). A uniform coat can be spread by drawing a polyethylene tube across the surface. Work small areas of 2 to 3 square feet and spread to fresh edges. The material will skin over in 3 to 5 minutes and, therefore, should not be reworked after that time. After the surface is coated, the panel can be installed directly over the wet underlay.

Table 634-5-1. MAGNESIUM-OXYCHLORIDE-RESORCINOL MASTIC FOR UNDERLAY

Material	Parts by Weight	Percent	Identification
Water	100	27.0	
Magnesium-Chloride	75	20.3	9Q-6810-00-281-4161
Magnesite Filter	175	47.3	9Q-5610-00-281-2738
Resorcinol Type A adhesive with catalyst	20	5.4	MIL-A-22397

634-5.4.3 DECK PREPARATION. The deck shall be cleaned to bright steel by abrasive blasting, wire brushing, or similar mechanical methods, and solvent-washed to remove grease and other residue. An expanded metal lath should be welded to the deck at 18-inch centers. The metal reinforcement should be lifted slightly above the deck to provide a keying action. Next, a surface wetting coat (paragraph 634-5.4.1, step c. should be brushed onto the deck and metal lath, taking care to cover all parts of the deck and metal lath. Drying of this coating should generally be allowed to take place overnight, before application of the mastic.

634-5.4.4 MASTIC PREPARATION. Mix the magnesium-oxychloride resorcinol mastic according to formulation in Table 634-5-1. Trowel the compound over the deck and expanded metal. Place panel while compound is wet. Lift panel to check for full contact and fill any low spots for final installation.

634-5.4.5 SEAM CAULKING. After cooling panels are installed, the seams between the panels and the deck shall be primed and then caulked with silicone rubber compound (paragraph 634-5.4.1, step b.).

634-5.5 REPAIR OF LEAKS IN CROSS-DECK TIEDOWN CHANNELS

634-5.5.1 GENERAL. As an economy measure, in lieu of cutting out the top plate of the tiedown channels, small holes in the base of these channels have been successfully gapped over and stopped by flowing in epoxy-Thiokol caulking compounds without removal of the steel cover.

634-5.5.2 MATERIAL. Palmer Epoxit caulking compound (PM 609), manufactured by Palmer Products, Incorporated, Worcester, Pennsylvania, or other NAVSEA approved equivalent is used.

634-5.5.3 PROCEDURE. Securing tracks are steam cleaned (about 100 pounds pressure) through the openings in the top surface to remove all oil, grease, and other foreign matter. Blow out and dry with compressed air. Mix the epoxy-Thiokol caulking compound (two-part compound) in accordance with manufacturer's directions. This material is liquid, but stiffens considerably at temperatures below 21°C (69°F). Before mixing, the resin may be warmed with a steam hose to lower the viscosity and make it easier to pour and stir. Pour the thoroughly mixed compound through the holes in the channels and spread with compressed air to a thickness of 1/16- to 1/8-inch.

SECTION 6.

CLEANING OF SHIPBOARD DECK COVERING

634-6.1 GENERAL PRECAUTIONS

634-6.1.1 Few materials aboard ship receive as much wear and cleaning as deck coverings. Rough and improper maintenance will quickly destroy the appearance and durability of these materials and lead to expensive replacement. Adherence to the rules and procedures given herein will improve appearance and prolong the life of deck coverings.

1. The most painstaking and careful maintenance of deck coverings may be wasted if the legs of furniture, especially chairs and other movable pieces, are not properly equipped with rubber tips to prevent scratching and denting of resilient deck covering surfaces. Nonslip rubber tips are available under National Stock Number (NSN) 9Z-5340-00-825-6503.
2. Avoid dragging heavy objects across unprotected resilient deck covering.
3. If at all possible, avoid using salt water on interior decks.
4. Do not use an excess of water, strong alkaline soaps, strong alkalis, lye, rough abrasives, very hot water, or steam on interior deck coverings.
5. Except for use of cosmetic coatings (see paragraph 634-3.10.4), never paint, varnish, or shellac any deck covering.
6. Protect decks with cover cloths during painting of bulkheads and overheads.
7. Protect deck coverings with scrap materials or heavy Kraft paper during shipyard overhauls and other repairs.
8. Wash deck coverings no more often than necessary for appearance or sanitation.

634-6.2 MATERIALS AND EQUIPMENT

634-6.2.1 Cleaning of shipboard deck coverings necessitates use of diverse materials and equipment, depending on application.

a. **Synthetic detergent cleaning solution** . The following cleaning solution should be used, except as otherwise specified herein: 1 to 4 ounces of detergent per gallon of warm, potable water. Rinse water should also be potable water. Do not use any other strongly alkaline cleaners, except as specified herein.

1. **Synthetic Nonabrasive Detergent** . P-D-220 NSN 7930-00-530-8067 (1 gallon), NSN 7930-00-527-1207 (5 gallons), or NSN 7930-00-527-1237 (55 gallons)
2. **Liquid Heavy-duty Synthetic Detergent** . P-D-223 NSN 7930-00-515-247 7 (1 gallon), or NSN 7930-00-526-2919 (5 gallons)

b. **Floor polishing and scrubbing machine** . CID A-A-50478, NSN 9Q-7910-00-680-8297

c. **Liquid sealer for terrazzo decking** . NSN 8030-00-007-8333 (1 gallon) and NSN 8030-00-007-8334 (5 gallon)

d. **Floor dressing for magnesite decking** . NSN 9Q-5610-00-281-7810

e. **Floor wax** . A slip-resistant water-emulsion-type available under Stock Number 7930-00-205-2870. This wax should be applied in a very thin coat and allowed to dry 30 minutes before traffic is permitted on it, and before polishing. It is a self-polishing wax, but the gloss of even the best of this type is improved by buffing after drying. A nonbuffing, slip-resistant, water-emulsion floor polish may be obtained under the following stock numbers:
   1. NSN 9Q-7930-01-184-3905 (1 gallon)
   2. NSN 9Q-7930-00-926-1689 (5 gallon)
   3. NSN 9Q-7930-01-183-8584 (55-gallon drum)

634-6.2.2 Approved detergents, disinfectants, deck finish, glass cleaner for MIL-D-3134 AND MIL-D-24613 deck coverings.

1. Detergent, General Purpose; for use in heads, showers, mess decks sanitary and other wet spaces or compartments:
   a. FED Spec, Type II, Liquid, Hard Water Soluble:
      (1) (Preferred) 2 ozs liquid per envelope, 288 envelopes a per box, use one envelope per 3 gallons of water. BX - NSN-7930-01-019-0808
      (2) (Preferred) 5 1/2 ozs liquid per envelope, 120 envelopes per box, use one envelope per 6-1/2 gallons of water. BX- NSN-7930-01-019-0809.
      (3) Bulk packaged:
      GAL. - NSN-7930-00-282-9699
      5 GAL. - NSN-7930-00-985-6911
      55 GAL. - NSN-7930-00-282-9700
   b. MIL-D-16791, detergent, Non-ionic, Type I, Fresh and Sea Water Soluble:
      (1) Bulk packaged:
      GAL. - NSN-7930-00-282-9699
      5 GAL. - NSN-7930-00-985-6911
      55 GAL. - NSN-7930-00-282-9700
2. Disinfectant, General Purpose, Quaternary Ammonium Compound; for use with detergents listed in paragraph 634–6.2.2, step 1above in appropriate dilution ratios:
   a. Commercial Item Description A-A-1441:
      5 lb. CAN - NSN-6840-00-558-1593
      25 lb. DR. - NSN-6840-00-551-3698
3. Finish, Floor (Deck), Acrylic, Non buffing; for 40-00-558-1593
   a. 25 lb. DR. - NSN-6840-00-551-3698

4. Finish, Floor, (Deck), Acrylic, Non-buffing; for use on Polymer or Mastic decks coverings.
   a. FED SPEC P-F-430:
      GAL. - NSN-7930-01-184-3905
      5 GAL. - NSN-7930-01-183-8585
      55 GAL. - NSN-7930-01-183-8584
5. Glass Cleaner; for use on glass, mirrors, stainless steel bulkheads or partitions ceramics, chrome, plastic laminate and painted surfaces:
   a. Commercial Item Description A-A-40:
      (1) Type I, Regular
         (a) Class 1, Ready to use liquid GAL. - NSN-7930-00-18 4-9423
         (b) Class 3, Aerosol (24 cans per box) BX - NSN-7930-00-664-6910
      (2) Type II, Antifogging
         (a) Class 1, Ready to use liquid GAL. - NSN-7930-00-901-2088

634-6.3 CLEANING TECHNIQUES

634-6.3.1 RESILIENT DECK COVERINGS (LINOLEUM, VINYL, VINYL ASBESTOS OR RUBBER TYPES). Frequency of maintenance will be determined by the amount and nature of traffic to which the area is subjected. The deck should not be washed more often than necessary to retain appearance. When necessary, it should be scrubbed with a stiff-bristle tampico brush or circular-brush scrubbing machines, or mopped with a damp mop using a synthetic detergent cleaning solution (see paragraph 634-6.2.1, step a). Large quantities of water are not necessary. Do not flood the area with detergent solution; use a limited quantity. This will prolong life of the material and prevent loss of adhesion to deck. Strong alkaline soap, abrasive cleaning compounds, or salt water should not be used. All water, cleaning compounds, and dirt should be removed and the floor rinsed with clean water using a damp, clean mop. Stubborn grease and dirt may be removed with fine steel wool or a rag moistened with paint thinner. Bimonthly, rubber tiles and sheet. Flexi-Flor should be mopped with a 5 percent solution of chlorox or equivalent. This procedure closes surface pores and makes decking more resistant to dirt pickup. After washing and drying, the tile or sheet may be buffed (without wax) to a velvet sheen with a buffing machine or given a coat of wax (except on submarines in control spaces) and allowed to dry without polishing. If a high gloss is desired, buff the dried wax with a polishing machine. To conserve wax and reduce maintenance, a deck should be rebuffed several times before rewaxing. The deck may require only rewaxing in the traffic lanes once a week if dirty spots are promptly wiped with a damp rag and such areas are immediately redone.

a. Static-conductive tiles or linoleum in medical operating spaces. Cleaning shall consist of scrubbing as specified for resilient deck covering. Waxes, oils, or polishes may be used with moderation.

b. Mastic (latex-mastic). See paragraph 634-3.9.2.8.1.

c. Terrazzo and Cosmetic Polymeric
   1. Cleaning maintenance shall consist of washing with the manufacturer’s recommended dilution ratios of the approved cleaning products listed in paragraph 634–6.2.2. Overstrength detergents can cause premature deck failure.
      (a) Pour hot solution on deck. Allow to soak for 10 minutes. Do not allow surface to become dry.
      (b) Swab thoroughly, then flush with fresh water. Repeat, if necessary.
   2. Alkali, chlorinated or hypochlorinated, and solvent based flammable detergents are prohibited from use in areas adjacent to bulkheads, glass or mirrors directly on or above terrazzo or cosmetic polymeric deck cov-

erings. Chemical agents in these cleaning compounds can discolor or erode the surface sealers exposing deck covering matrix to chemical and moisture attack, causing premature deck failure.

3. Spills of concentrated detergents, disinfectants, toilet bowl cleaners, and other chemical materials shall be cleaned immediately. Soak up spill followed with continuous water flushing for several minutes to dilute concentration in spill area.
4. Conduct a monthly deck inspection, noting the following:
   (a) Deck softening or deck material rupture.
   (b) Terrazzo matrix exposure, erosion, or both.
   (c) Sealer wear and erosion.
   (d) Surface staining, yellowing, or both.
5. Repair, replacement, or resealing of the deck covering may be necessary pending results of inspection. These procedures shall be done according to paragraph 634-3.10.

NOTE

Ship's personnel are instructed not to attempt to reseal or repair decks with epoxy or polyurethane components under any circumstance. These materials are considered hazardous and are to be installed by professionals.

(a) Decks requiring resealing will be resealed by ship's personnel using multiple thin coats of acrylic floor finish specified in paragraph 634–6.3.2. This procedure will maintain deck integrity until the ship has access to a SUPSHIP, Shipyard, IMA/SIMA activity or homeport facilities where repairs can be contracted.

(b) Decks requiring replacement with a service life of less than six months shall be reported as a material failure to the installing activity (SUPSHIP, Shipyard, IMA/SIMA) and the life cycle manager (NAVSEA, Code 05M1) via Quality Deficiency Report (QDR), (GSA, Standard Form 368, April 74)

634-6.3.2 MAGNESITE. Scrub as specified for resilient deck coverings. After some time in service, the color of the decking may fade. Do not paint to renew color. To restore color, the deck should be sanded lightly with No. 0 steel wool, washed as above, and allowed to dry thoroughly. Apply a floor dressing (NSN 9Q-5610-00-281-7810) to help develop a uniform color. It should be applied with a paint roller, brush, or rag and allowed to penetrate. A second or third application may be required in some areas that absorb rapidly. Any excess left on the surface after 10 or 15 minutes should be wiped off so that the dressing dries in the pores of the magnesite rather than on the surface. Allow the dressing to dry overnight before walking on the deck. Resealing may be required every 6 months or more frequently to maintain the appearance of magnesite.

634-6.3.3 RUBBER SWITCHBOARD MATTING. Wash with synthetic detergent cleaning solution (paragraph 634-6.4.1).

634-6.3.4 CARPETS. Refer to paragraphs 634-3.18.5 and 634-3.18.7 for spot cleaning and major cleaning, respectively. Carpets should be cleaned with a vacuum cleaner as frequently as required. Remove grease spots as soon as possible using a cleaning solvent described in paragraph 634-6.2.1, step a. Occasionally the carpet may be cleaned with a stiff floor brush and cleaning solution to brighten up its color. The brush should be dipped into the foam only, and the foam rubbed into the carpet. The cleaned portion is then wiped dry with a dry rag. It is important that the carpet be allowed to dry before it is opened to traffic. The foregoing treatment may also be utilized for localized spots of dirt and grease. Wet the carpet as little as possible as excessive moisture may lead to mildew or contribute to deck corrosion.

634-6.3.5 FLIGHT DECKS. The procedures developed specifically for cleaning aircraft carrier flight decks to remove grease, fuel, and hydraulic fluids are detailed in paragraph 634-6.4.

634-6.4 FLIGHT DECK CLEANING

634-6.4.1 GENERAL PROBLEM. During flight operations, flight decks become contaminated with aircraft fuel, cable greases, hydraulic fluids, and lubricants. These contaminants contribute to fire and slip hazards for both personnel and aircraft. Depending on the intensity of operations, very little time may be available to accomplish the very essential flight deck cleaning that may be required. Two methods of flight deck cleaning have been developed; one is for routine use while in port or at sea following routine air operations where adequate time is available for cleaning, the other is for use when the tempo of air operations limits time available for cleaning. Several brand name cleaners recommended by different aircraft carriers and several laboratory formulations were evaluated in the development of the two methods given below. It is recognized that availability of dependable rider-type scrubbing machines would expedite flight deck cleaning. Some ships have experimented with deck cleaning machines available on the commercial market, but these have been deficient in one respect or another-configuration, vertical stability, durability, etc. A program for the development of a scrubbing machine designed for shipboard use is underway. Cleaning of the flight deck while in port is not permitted due to environmental concerns.

634-6.4.2 APPROVED CLEANING METHOD. This method may be used on aluminum or steel, coated or uncoated flight decks, or hangar decks and is applicable to cleaning wood surfaces which have polyurethane overlay.

a. Materials required:
   1. Detergent, general purpose, liquid, non-ionic, water soluble, MIL-C-85570 Type II, NSN 7930-00-985-6911, (5 gallons) or NSN 7930-00-282-9700, (55 gallons).
   2. Sodium metasilicate, Technical, Anhydrous, or Pentahydrate. One pound anhydrous equals 1.6 pounds pentahydrate. The pentahydrate form is preferred because it dissolves more readily. Anhydrous - 100-pound drum - NSN 6810-00-664-7062 Pentahydrate - 100-pound drum - NSN 6810-00-209-8175

b. Equipment Required:
   1. Deck swab with handle
   2. Rattan push broom
   3. Wood handle push broom
   4. Flight deck scrubbing machine, if available
   5. Protective clothing

c. **Safety requirements** . Use eyeshields to protect the eyes from cleaning solutions or sodium metasilicate dust. If contact occurs, wash eyes with large amounts of fresh water for a few minutes. Report to physician immediately for further treatment. If practical, stand upwind whenever handling, mixing, or applying dry chemicals or solutions.

d. **Procedure** . Prepare solution by half filling a 30-gallon GI can with fresh water (water should be at 75°F or warmer). While stirring, add eight pounds of sodium metasilicate, pentahydrate or five pounds of anhydrous sodium metasilicate. (For a volumetric approximation of this weight, a one quart container would hold about 2-1/4 pounds of this material and a one gallon container about nine pounds). When solution is complete, add

one gallon of water-soluble, general purpose, Type I, detergent; fill with fresh water to the 30-gallon level. Stir until the contents are thoroughly mixed. This batch should be sufficient for approximately 3000 square feet.

1. Take every precaution to prevent entry of solution or water into the slots of catapult tracks on carriers. Failure to observe this precaution will result in excessive corrosion of the track's components.
2. On carriers, remove the arresting gearcables before cleaning the deck in the cable area. Failure to remove cables will result in loss of lubricant with consequent corrosion and wear. Before applying solution to deck surfaces near cable sheaves on carriers, plug the deck openings in these areas. This will prevent entry of solution into the arresting gear and below deck spaces.
   (a) Apply the solution uniformly to the deck surface with a swab.
   (b) Scrub the wetted surface vigorously with a fiber-bristle broom or with deck scrubbing machine.
   (c) Hose down the treated surface with a high-pressure stream of salt water, washing the solution away from the catapult tracks.
   (d) The degree of cleanliness can be determined by vigorously rubbing the cleaned surface with a clean white cotton cloth. If any soil can be transferred to the cloth, the surface should be recleaned and retested.
3. As an alternative to use of the detergent-sodium metasilicate mixture described above, there is a premixed solution available in the standard stock system which may be used in deck cleaning. This material is not as effective as the mixture described, but it may be used when the above preferred ingredients are not available. This product is a liquid heavy duty, synthetic cleaning concentrate, available as follows: 1 gallon NSN 7930-00-515-2477
   5 gallon NSN 7930-00-526-2919
   55 gallon NSN 7930-00-526-2920
4. The above stock material should be used in a concentration of two gallons or more per 30 gallons of cleaning solution required in cleaning flight or hangar decks. Application and rinsing should be as described for the sodium metasilicate-detergent solution.
5. Proprietary products from following the commercial manufacturer's are approved for use:

   Allied Enterprises
   814 West 45th Street
   P.O. Box 6159
   Norfolk, VA 23508-6159

   B & B Chemical Co., Inc.
   P.O. Box 660-796
   Miami, FL 33166
   Product: B & B 88NA

   Beach Chemical and Paper Co.
   1356 London Bridge Road
   Virginia Beach, VA 23456
   Product: Formula No. 909
   Deck and Aircraft Cleaner

   DC Filter and Chemical, Inc.
   P.O. Box 1350 Sandusky, OH 44870
   Product: Speedy

   Drew Chemical Corp.
   4565 Progress Road

Bldg B, Suite 3
Norfolk, VA 23502
Product: Edge

Industrial Chemical Products of Detroit, Inc.
12801 Newburgh Road
Livonia, MI 48150
Product: Cleaner 888

Uni-Kem International P.O.
Box 23384 Harahan, LA 70183
Product: Liftkleen Heavy Duty Cleaner

(a) It is recommended that the above cleaner be diluted to twenty-parts saltwater and one-part cleaner, applied to the deck, scrubbed with corn brooms or the deck scrubbing machine and rinsed with saltwater. For lightly soiled areas, mixing ratios higher than 20:1 may be used. Mixing ratios lower than those recommended by the manufacturer should not be used.

(b) Splash-proof goggles, faceshields, impermeable gloves and aprons should be worn by personnel involved in the mixing and use of these products. Provisions of the material safety data sheets (MSDS) and the hazardous materials information system (HMIS), DOD Instruction 6050.5, must be complied with implicitly. Of particular concern are those areas dealing with eye, skin and hand protection, protective clothing, ventilation, respiratory protection, handling, material incompatibilities and storage precautions. When required by the MSDS/HMIS for each product, appropriate respiratory protection must be used. All handling and storage provisions of the MSDS/HMIS must be complied with. If the material is splashed into unprotected eyes, they must be flushed with potable water for at least 15 minutes. This shall be considered an emergency.

634-6.5 TEAK DECK CLEANING

634-6.5.1 MATERIALS REQUIRED

a. Soap, Scrubbing FSN 9350-00-247-0543

b. Oxalic acid, dihydrate FSN 6810-00-264-3937

c. Detergent, general purpose FSN GS-09F-43513

d. Lemon/Lime mix NSN 8950-00-139-7526

e. Sand

f. Teak cleaner Available through Hocking International Chemical Corporation, 2121 Hoover Ave, National City, CA

634-6.5.2 EQUIPMENT REQUIRED

a. Firebrick FSN 9350-00-247-0543

b. Man helper FSN 7920-00-141-5452

c. #6 canvas FSN 8305-00-170-5385

d. Scrub brush FSN 7920-00-240-7171

e. Trash can FSN 7240-00-160-0441

f. Squeegee FSN 7920-00-224-8339

634-6.5.3 PROCEDURE

634-6.5.3.1 Fire Brick

1. Cut fire brick in half with band saw cutting across the length to make two equal size square sections.
2. Chip depression 1 inch deep by 2-1/2 inches in large surface of each brick to facilitate placement of man helper.

634-6.5.3.2 Liquid Mix

1. Mix 18 gallons of hot water, one gallon general purpose soap, one box scrubbing soap, and either one container of oxalic acid or 20 pkgs lemon/lime mix. Allow to set overnight until forming a pasty mixture.

634-6.5.3.3 Holystoning

1. Thoroughly wet deck with salt water.
2. Spread sand by hand, using a sweeping motion, over the area to be holystoned.
3. Swab deck using liberal amount of liquid mixture from paragraph 634-6.5.3.2, step 1.
4. Line a maximum of 14 personnel in a straight line, positioning them about 16 inches apart, along the length of boards to be holystoned.
   a. Each man shall have a fire brick and man helper.
   b. Brick is placed flat on deck with depression (see paragraph 634-6.5.3.1, step 2.) for man helper facing up.
   c. Hold man helper behind right shoulder, over the right forearm with right wrist twisted to grip the man helper. Grip the man helper with the left hand placed just above the right hand. When the man helper is placed in the depression, the man will be bent at the waist.
5. Rotate shoulders fore and aft, push and pull with left hand. By this method the brick will scrub approximately 20 inches of board.
   a. Each man’s stroke will overlap the man’s beside him.
   b. Use 10 strokes per board ensuring strokes are made with the grain of the board.
6. Hose off deck with fire hose and dry using squeegee.

634-6.5.3.4 Uneven Boards

1. Where edges of boards are not flush it may be necessary to use a long handled scrub brush with No. 6 canvas stapled around the bristle.
2. Use additional sand and follow procedure as directed above as fire brick will smooth the edges so boards are flush.

634-6.5.3.5 General Notes. Oxalic acid will yield the same results as the lemon/lime mix, however, the lemon/lime mix is more economical. Oxalic acid shall not be mixed with the lemon/lime mix nor any other type acid. Teak cleaner is very expensive and shall be used only for small areas requiring attention.

SECTION 7.

MISCELLANEOUS REPAIRS

634-7.1 FILL FOR DEEP CREVICES

634-7.1.1 To prevent the accumulation of water and excessive corrosion in deep crevices and angles on the ship interior where drainage holes are not feasible, fill with materials such as identified below and slope the covering away from the shell to provide drainage. For example, the acute angles formed by some stringers are suitable for this treatment. Remove rust, oil, and grease from steel to maximum practical extent and apply two coats of MIL-P-24441 primer, F150. Pour lightweight concrete with a vermiculite or pumice aggregate to within 3/4–inch of the surface. Allow the concrete to dry and top with mastic deck covering MIL-D-3134, type II, to a maximum thickness of 3/4 inch. Slope the covering away from the shell to provide drainage. Directions for mixing and application of mastic are covered under paragraph 634-3.9.

634-7.2 COMPLETE REMOVAL OF NONSKID

634-7.2.1 GENERAL. The old non-skid coating may be removed either mechanically, chemically, or using a combination of both.

634-7.2.2 MECHANICAL METHODS. Several methods are available for removal of nonskid coating by mechanical means.

1. Abrasive blasting (vacublasting) should provide the optimum form of surface preparation for subsequent coating because it can produce clean bare metal, even in pits and tight areas, as well as an anchor pattern to promote maximum adhesion.
2. The Tennant machines or a combination of Tennant equipment in conjunction with other grinders, chippers, or sanders, although not producing a surface equivalent to abrasive blasting, have been used as effective alternatives.
3. New and promising deck blasting equipment is now available for removing old deck coverings and preparing the steel for a primer coat. The NELCO self-propelled horizontal shot blast machine produces a near-white steel surface ready for priming with minimum dust and debris accumulation on surrounding areas. The machine was designed and fabricated by the R. T. Nelson Co. of Oklahoma City, Oklahoma. Although the equipment is bulky and requires a skilled operator, it can prepare a steel surface for coating in a fraction of the time required by other methods. Two men are required to operate the equipment in the field, one to regulate the speed of the cleaning operation and the type of surface profile produced and the other to help guide and move electrical wires and flexible hoses in the path of the machine. The equipment's capacity is approximately 4000 sq ft/man/8-hr shift for removal of old nonskid, and about 8000 sq ft/man/8 hr shift for preparation of new steel (uncoated or coated only with an anticorrosion primer).
4. Whichever method or combination of methods is used, the surface must be sufficiently cleaned and roughened to provide a tooth or mechanical bond for the new coating. Small stubborn areas may require additional sanding prior to the application of the primer.

634-7.2.3 CHEMICAL/MECHANICAL METHOD. Chemical stripping of the deck followed by abrasive brushing-disc sanding is an alternative method which also has been used successfully. It is considered economical and eliminates much of the noise associated with the mechanical methods.

1. Materials and equipment required are
   a. Remover, paint, organic solvent type TT-R-251, type III, Class B.

NOTE

Not all paint removing compounds procured from Navy Supply System as specification TT-R-251, type III, Class B material have been satisfactory for this application. Paint removers manufactured by: Trio Chemical Company, Brooklyn, New York; W. H. Barr Chemical Company, Memphis, Tennessee; and Jasco Chemical Company, Mountain View, California have been satisfactory. When ordering epoxy nonskid stripping compound, the invitation to bid and the contract for purchase shall stipulate: In addition to conforming to all of the requirements of FED SPEC TT-R-251, type III, Class B, paint remover supplied under this contract shall soften 25 mil thick cured epoxy-polyamide nonskid coatings conforming to specification MIL-D-23003 or MIL-D-24483 sufficiently within a period of 15 to 120 minutes in the temperature range of 50°F to 80°F, to permit their easy removal from ships decks in the ratio of 20 square feet of non-skid coating per gallon of remover compound. The invitation for bid and the contract for order shall include a first article approval clause.

   b. Butyl cellosolve, technical grade, local purchase.
   c. Naptha, aromatic, TT-N-97, type II, FSN 9Q-6810-244-7639 (55-gallon drum).
   d. Plastic film, polyethylene, L-P-378, 12 feet wide, 100 feet long, 0.006 inch thick.
   e. Two-by-fours, wood, 14 feet long.
   f. Deck cleaning machine. Tennant Model KDC, Tennant Company, Minneapolis, Minnesota.
   g. Wire brush, 20 gauge, for Tennant deck cleaning machine.
   h. Abrasive coated nylon-fiber brush for Tennant deck cleaning machine.
   i. Ice scraper and chipper, sidewalk. GGG-1-100, FSN 9Q-5120-329-3299.
   j. Squeegee blade, floor, heavy duty, ZZ-S-666, FSN 9Q-7920-224-8339.
   k. Squeegee handle, H-B-071, FSC 9Q-7920-141-5452.
   l. Broom, corn, H-B-51, FSN 9Q-7920-291-8305.
   m. Broom, horse hair, push type, H-B-651, FSN 9Q-7920-292-2363.
   n. Handle, broom, NN-H-104, FSC 9Q-7920-263-0328.
   o. Spreader, paint remover. Fabricate as follows: Attach a 6-foot handle to the middle of the 4-inch by 36-inch surface of a 1-inch by 4-inch by 36-inch straight-edge wood board at a 45-5 angle. Place clearance-adjusting screws at 1, 18, and 35 inches along the middle of the bottom 1-inch edge. Adjust screws to give approximately 1/8 inch clearance between deck and straight-edge. By trial and error make final clearance adjustment so that paint remover will be spread in the ratio of 1 gallon per 20 square feet.
   p. Faucet, drum and barrel, WW-F-25, FSN 9Q-4510-595-1785.
   q. Sander, disk, electric, portable, O-S001116, type II, Style 1, Size 9, FSN 9Q-5130-226-5388.
   r. Disks, abrasive aluminum oxide; closed coat, resin bonded, P-D-455, type II, Class 1, NSN 9Q-5345-881-7597 16 grit NSN 9Q-5345-238-5714 24 grit.

s. Rope for barrier.
t. Signs: NO SMOKING/NO WELDING/NO BURNING WITHIN 50 FEET OF THIS SIGN.
u. Coveralls.
v. Goggles, close fitting, rubber framed, clear glass.
w. Gloves, neoprene.
x. Boots, neoprene.

2. Procedure. The optimum condition for nonskid removal by chemical stripping are ambient temperatures between 10°C and 21°C (50°F and 70°F), still air, and protection from direct sunlight. The lowest wind velocity which will still provide adequate ventilation for removal of methylene chloride vapors is desirable. Most efficient deck stripping can be accomplished by limiting work to that part of the day when near optimum conditions prevail, generally in the early morning hours. Covering the freshly applied paint remover with polyethylene sheeting minimizes the effect of sun and wind, significantly increasing stripping efficiency. Proceed as follows:
   1. Remove heavy grease by scrubbing deck in accordance with paragraph 634-6.4.1 or 634-6.4.2, method 1, respectively.
   2. Rope off area and post safety signs.
   3. Fill hold-down cavities with rags to prevent their filling with paint remover.
   4. Cover the NBC washdown (light water) nozzles with masking tape or stuff with rags.
   5. Sweep surfaces clean.
   6. Apply paint remover and strip deck of non-skid. Follow instructions of paint remover manufacturer.
   7. Wipe stripped surfaces with a mixture of one part aromatic naphtha and one part butyl cellosolve to remove any surface contamination.
   8. Sanding by abrasive brush or disc is recommended prior to application of primer.

634-7.2.4 SAFETY PRECAUTIONS. Methylene chloride, the principal solvent in the paint remover, is dangerous to the eyes but otherwise is only moderately toxic. It is not a fire or explosion hazard under normal conditions of use, but it is dangerous when heated to decomposition because it emits highly toxic fumes of phosgene. Vapors of methylene chloride, being almost three times as heavy as air, tend to collect in low, unventilated spaces. If permitted to accumulate, they can reach dangerously toxic concentrations. The following safety precautions must be observed:

1. Exposed personnel shall be thoroughly instructed regarding hazards of the process.
2. Persons working with the paint remover shall wear: tight-fitting, rubber-framed, chemical-type goggles; rubber (neoprene) boots; rubber (neoprene) gloves; and coveralls.
3. Hatches and vents leading to lower spaces shall be secured to prevent entry of methylene chloride vapors into these areas.
4. The area to be treated shall be roped off and signs reading **NO SMOKING/NO BURNING WITHIN 50 FEET OF THIS SIGN** shall be conspicuously posted at the perimeter of the area.

APPENDIX A

DETERMINATION OF HUMIDITY AND DEW POINT

634-A.1 EXAMPLE

634-A.2

The following wet and dry bulb temperatures were obtained by using a sling psychrometer:

a. Wet Bulb = 5°F

b. Dry Bulb = 64°F

634-A.3

Find the humidity and dew point by using the psychrometric chart shown in Figure 634-A-1.

a. Step 1. The dry bulb temperature is located on the x-axis at the bottom edge of the chart. Locate the dry bulb temperature that was obtained with the sling psychrometer (64°F) on the x-axis, and draw a line perpendicular to the x-axis from the bottom of the chart up to the saturation curve (the top curved line which represents 100% humidity). See Figure 634-A-2.

b. Step 2. The wet bulb temperature can be found along the saturation curve (100% humidity). Locate the wet bulb temperature that was obtained with the sling psychrometer (56°F), and draw a line along the isotherm from the saturation line until the line being drawn intersects the line drawn in Step 1. See Figure 634-A-3.

c. Step 3. From the point of intersection of the lines drawn in Step 1 and Step 2, draw a line to the left, parallel to the x-axis until the saturation curve is intersected. The point of intersection of the saturation curve and the line just drawn is the dew point temperature, in this case, 50°F. See Figure 634-A-4.

d. Step 4. Draw a line through the intersection of the lines drawn in Step I and Step 2. The line being drawn shall be parallel to the humidity curves preprinted on the psychometric chart. The location of the line drawn determines what the relative humidity is. For this example, since the line drawn is between the 50% and 60% relative humidity lines (but very close to 60%), the relative humidity is approximately 58%. See Figure 634-A-5.

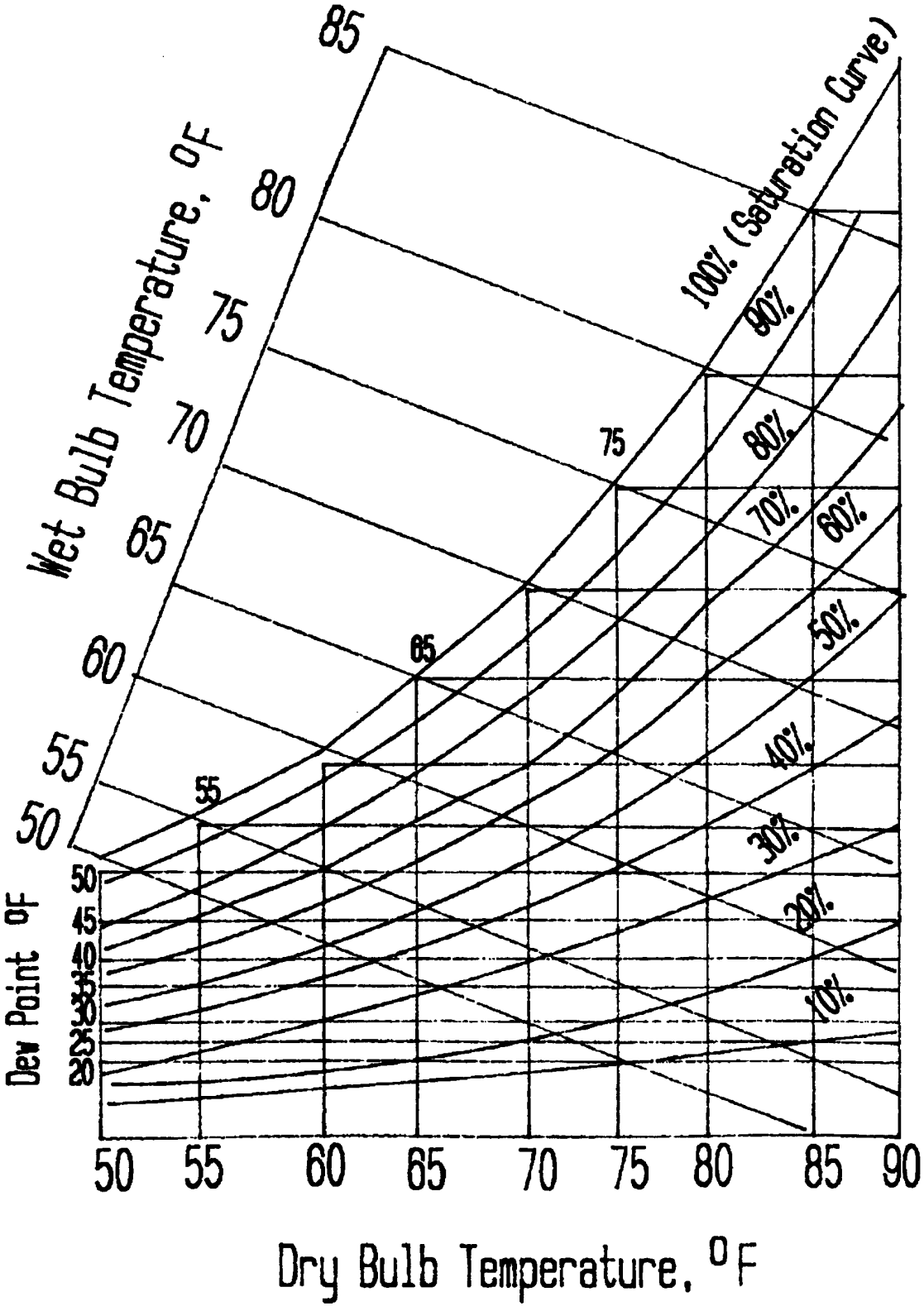


Figure 634-A-1. Psychrometric Chart

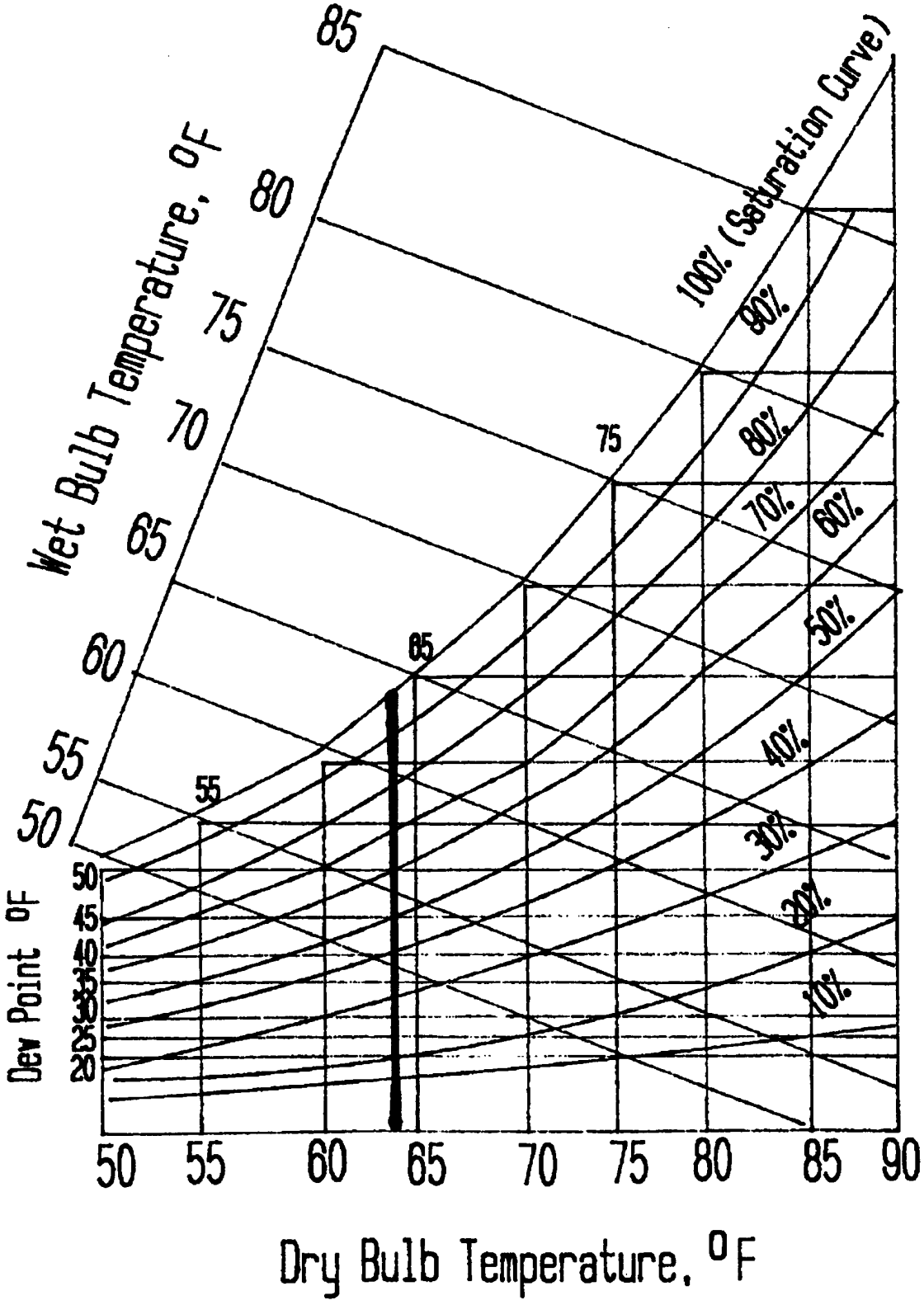


Figure 634-A-2. Step 1

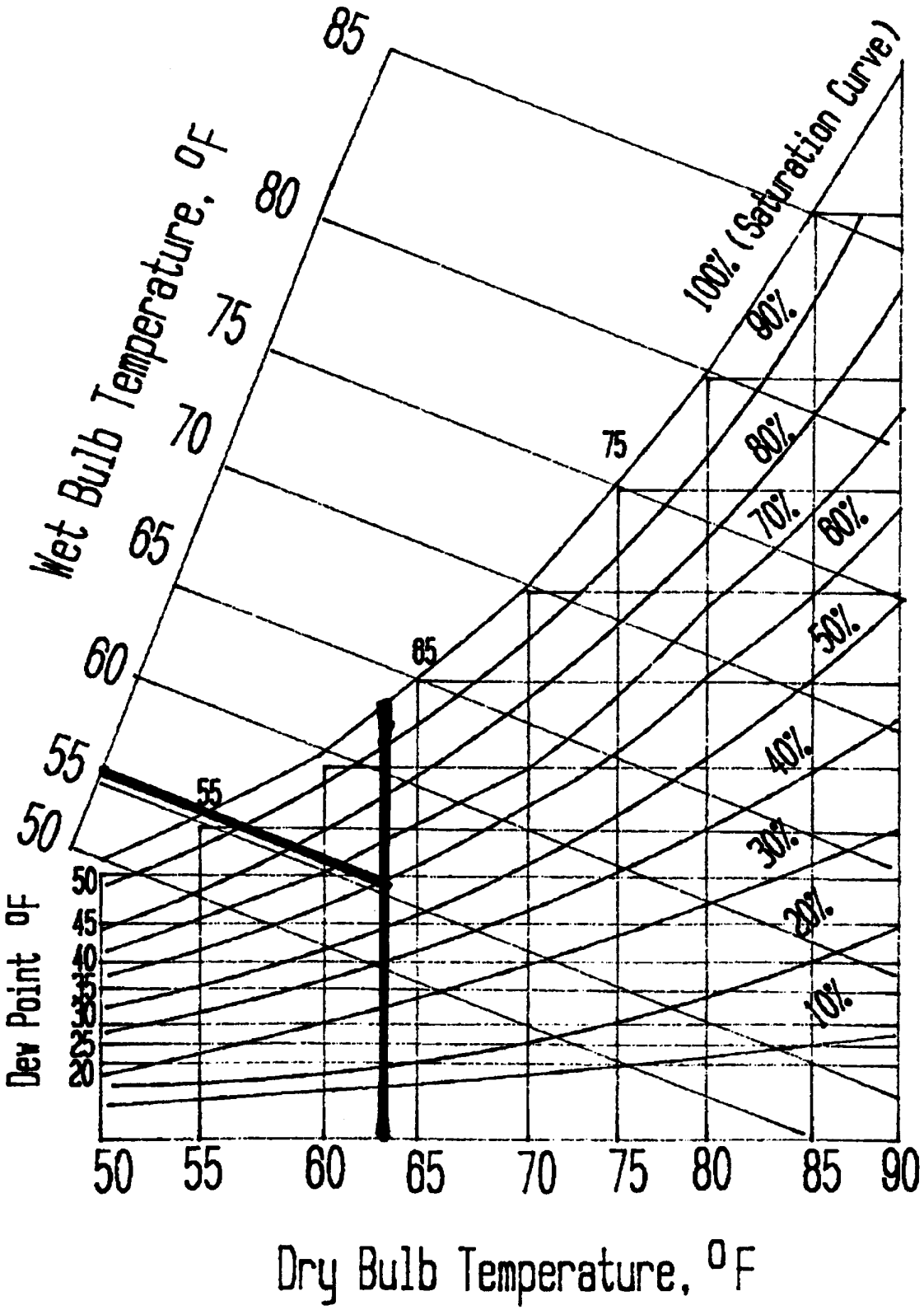


Figure 634-A-3. Step 2

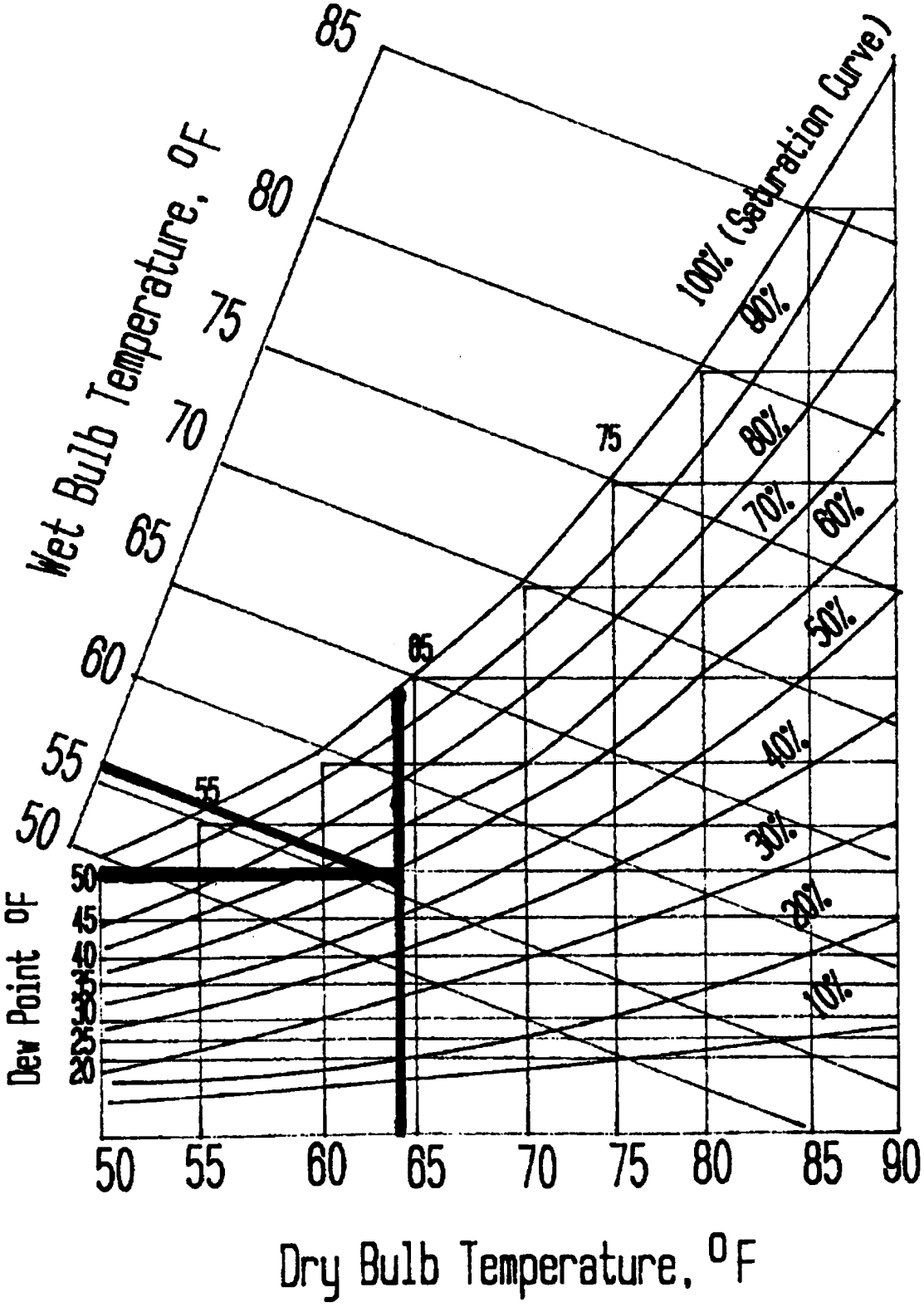


Figure 634-A-4. Step 3

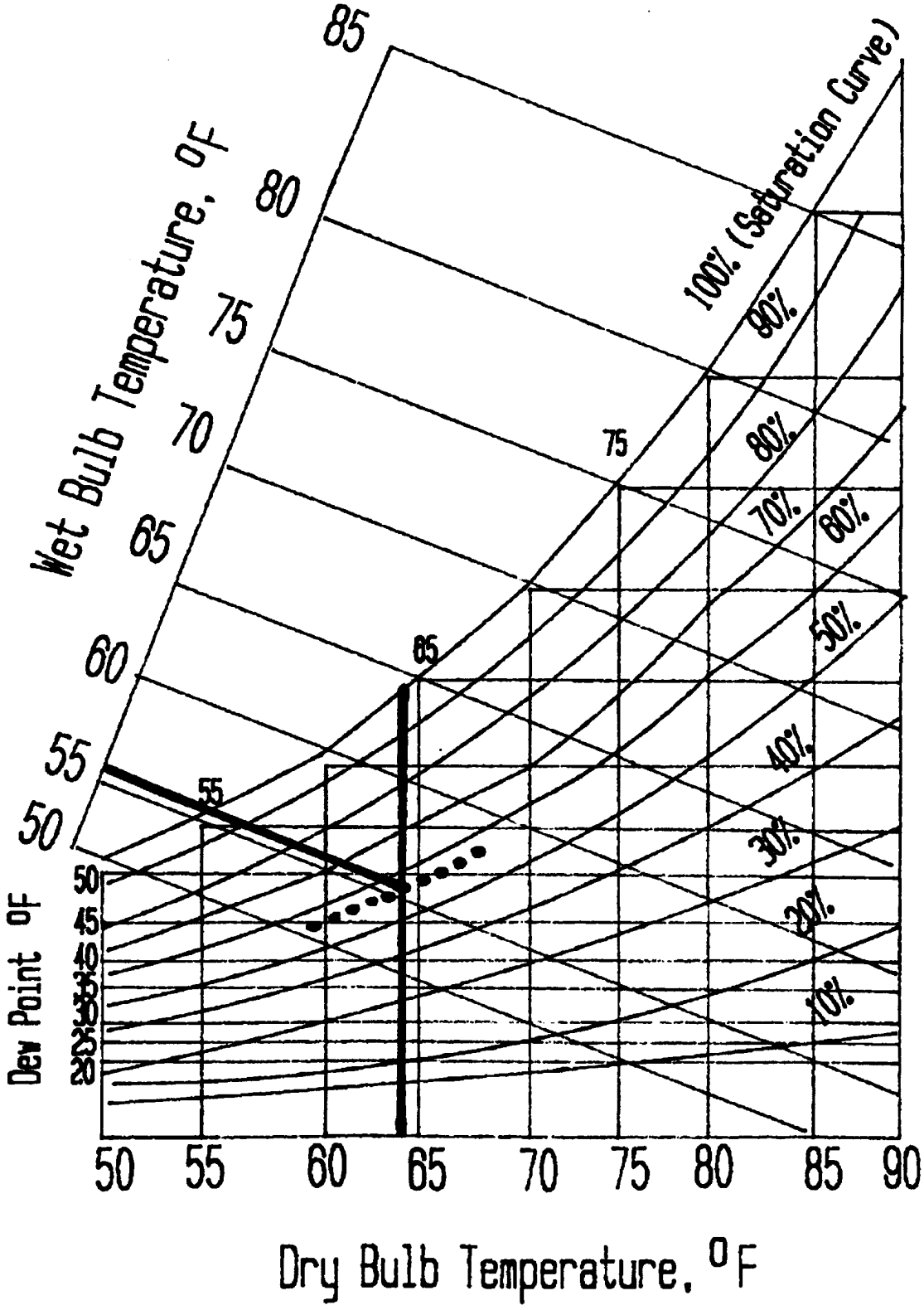


Figure 634-A-5. Step 4

APPENDIX B

DETERMINATION OF DRY FILM THICKNESS (DFT) ACCEPTABILITY

634-B.1 EXAMPLE

634-B.2

DFT readings were taken in the areas shown in Figure 634-B-1.

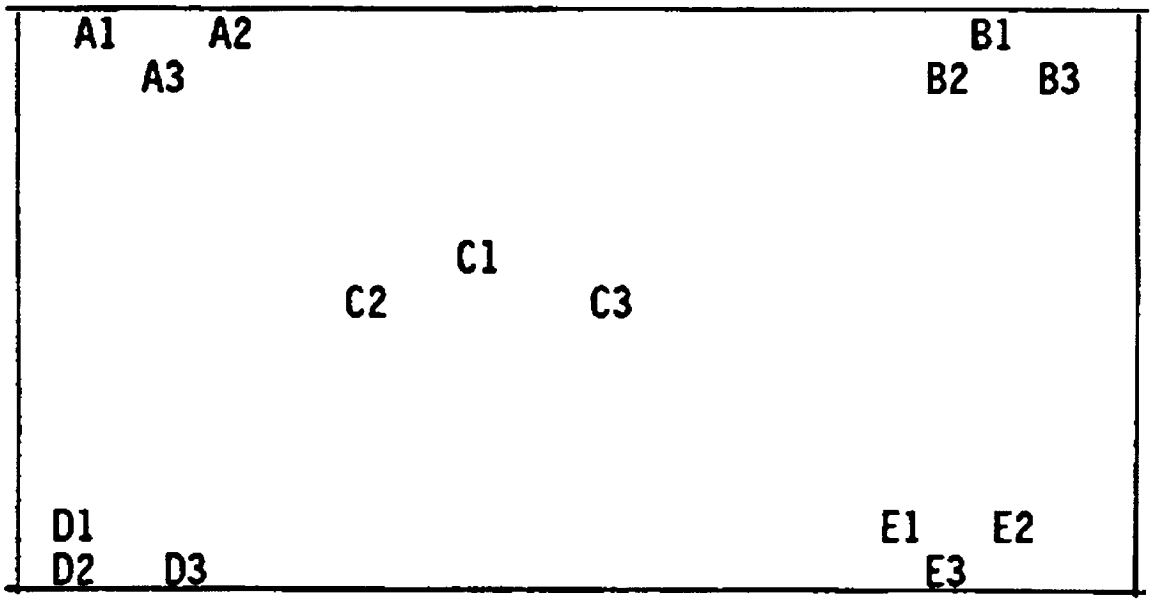


Figure 634-B-1. DFT Reading Locations.

634-B.3

A DFT range of 4 to 6 mils is required. If the readings listed in Table 634-B-1 were taken, determine if the requirements of paragraphs 634-3.28.10 through 634-3.28.10.2 are met.

Table 634-B-1. DFT READING AND CALCULATIONS

AREA	1	2	3	Total (1+2+3)	Total + 3 (Average)	% of Minimum Required DFT
A	3.3	4.0	4.0	11.3	3.8	95
B	4.0	4.7	6.4	15.1	5.0	126
C	5.0	4.8	4.7	14.5	4.8	120
D	4.5	4.2	4.2	12.9	4.3	108
E	7.5	4.2	4.0	15.7	5.2	131
Total of Averages: 23.10						
Divide by 5 (5 spots) /5						
Average of the 5 spot measurements: 4.6 mils						

634-B.4

Since all spot measurements are at least 80% of the minimum required DFT, no more than one individual reading per spot is out of the required range by 20% (readings B3 and E1), and the average of the five spot measurements falls within the specified DFT range, the application is acceptable.

REAR SECTION

NOTE

TECHNICAL MANUAL DEFICIENCY/EVALUATION EVALUATION REPORT (TMDER) Forms can be found at the bottom of the CD list of books. Click on the TMDER form to display the form.